GEOLOGY

Physiographic Region

The North Fork Watershed lies within the Salem Plateau Subdivision of the Ozark Plateau Physiographic Region. The Salem Plateau is an ancient uplift plain long exposed to the dissecting action of streams. The North Fork Watershed is located in "one of the most rugged portions of the Missouri Ozarks" (Smith 1990). Stream dissection following successive Paleozoic uplifts has created a landscape of steep ridges and high bluffs bordering the deeply entrenched drainage. Elevations range from a maximum of approximately 1660 feet above mean sea level (msl) near Cedar Gap, Missouri to 554 feet above msl (the level of Norfork Lake at conservation pool). Local relief data (Local relief refers to the difference in elevation between two nearby points such as a valley and an adjoining ridge top) obtained from the Missouri Department of Conservation (MDC) Fisheries Research Fish Collection Database (1998a) for fish collection sites within the watershed indicate a minimum of 171 feet at a site located on Middle Indian Creek and a maximum of 378 feet at a sample site located on lower Bryant Creek. The North Fork Watershed is also characterized by prominent karst features, such as caves, springs, sinkholes, and losing streams.

Geology

The surface of the North Fork Watershed lies entirely in dolomites and sandstones of Ordovician and Mississippian Age (Figure Ge01). The surface geology of the uplands of the watershed lie in Jefferson City dolomite. Sandstone and dolomite of the Roubidoux Formation make up the geology of most of the stream valleys (MDNR 1994). The more acidic residuum resulting from the weathering of Roubidoux strata has allowed the shortleaf pine (Pinus schinata) to become a prominent forest component of the uplands of eastern Douglas and Ozark counties. In the middle and lower parts of the watershed, dolomites of the Gasconade formation are exposed. It is from this strata that most of largest springs of Missouri, as well as the North Fork Watershed, have developed (MDNR 1994).

Soils

The North Fork River Watershed occurs within the Ozarks Soil Region. Allgood and Persinger (1979) describe the Ozark Soils Region as "cherty limestone ridges that break sharply to steep side slopes of narrow valleys. Loess occurs in a thin mantle or is absent. Soils formed in the residuum from cherty limestone or dolomite range from deep to shallow and contain a high percentage of chert in most places. Some of the soils formed in a thin mantle of loess are on the ridges and have fragipans, which restrict root penetration. Soil mostly formed under forest vegetation with native, mid-tall and tall grasses common in open or glade area."

The following is a list of soil associations found in the North Fork Watershed:

Captina-Clarksville-Doniphan: "Nearly level to very steep, moderately well drained to excessively drained loamy upland soils that have fragipans or soils that are cherty throughout." (Allgood and Persinger 1979)

Captina-Macedonia-Doniphan-Poynor: "Nearly level to very steep well drained and moderately well drained, loamy upland soils that have fragipans or soils that are cherty throughout." (Allgood and Persinger 1979)

Hartville-Ashton-Cedar Gap-Nolin: "Deep, nearly level to gently sloping, somewhat poorly drained to excessively drained, loamy bottom land soils." (Allgood and Persinger 1979)

Lebanon-Hobson-Clarksville: "Gently sloping to very steep, moderately well drained to somewhat excessively drained, loamy and clayey soils with fragipans or soils that are cherty throughout." (Allgood and Persinger 1979)

Wilderness-Clarksville-Coulstone: "Gently sloping to very steep, moderately well drained to excessively drained, loamy upland soils that have cherty subsoils or fragipans." (Allgood and Persinger 1979)

Stream Order, Mileage, Permanency, and Springs

Stream order is "a hierarchy in which stream segments are arranged" (Judson et al. 1987)

The process of stream ordering is accomplished by examining maps and assigning orders to stream segments based on other streams which flow into them. When two stream segments of the same order join, the new segment they create is the next highest order. For instance, a first order stream would be a stream in which no other streams intersect it. A second order stream is created by the joining of two first order streams. A third order stream is created by the joining of two second order streams and so on. If the main channel of a stream happens to be a lower order than that of the intersecting stream, the main channel assumes the higher order. If the main channel is a higher order stream than the intersecting stream, it maintains the higher order (Figure Ge02). Two types of order are discussed within this document: Horton order which is the maximum order of a stream at its mouth; and Strahler order which is the immediate order of a stream at any given segment of its length. For instance the Strahler order of No Name Creek at point A in Figure Ge02 is second order while the Horton Order for the main channel designated as No Name Creek is third order. Unless otherwise stated, order references will refer to Horton order.

Using United States Geological Survey (USGS) 7.5 minute topographic maps, a total of 139 third order and larger streams were identified within the North Fork Watershed (Table Ge01). Of these 27 occur within the Norfork Reservoir Drainage; 56 occur in the North Fork River Drainage above Bryant Creek; and 56 occur within the Bryant Creek Subwatershed. Of the 139 third order and larger streams within the watershed, 104 are third order, 23 are fourth order, 9 are fifth order, and 2 are sixth order. The North Fork River becomes seventh order at the confluence of Spring Creek, approximately 1.5 river miles below Highway 14 in Ozark County (Figures Ge03, Ge04, Ge05).

Third order and larger streams account for approximately 972.1 miles of stream channel within the North Fork Watershed. Of the 972 stream miles, third order streams account for the most stream miles at 431.4, while fourth, fifth, sixth, and seventh order streams account for 224.4, 160.4, 89.3, and 66.6 stream miles respectively.

Stream mileage per order (Strahler) for fifth order and larger streams was determined using data digitized from USGS 7.5 minute topographic maps (Table Ge02). Fifth order segments account for most of the stream miles at 108. Seventh order stream segments account for the least amount of stream miles at 11.

Third order and larger streams within the North Fork Watershed were classified as permanent or intermittent as indicated on USGS 7.5 minute topographic maps. It should be noted that standard series as well as provisional series maps were used. Attributes for denoting permanent vs. intermittent flow

were different between standard and provisional series maps. Further, it appeared as though the length of permanent stream was greater among the standard series maps. This information was amended to reflect data obtained from stream field observations performed by MDC Ozark Region Fisheries Personnel during July and August of 1990-1994 (Figures Ge03-05). It is estimated that of a total of 972 miles of third order and larger streams, 276 miles (28.4%) have permanent flow. The remaining 696 miles are intermittent streams, some perhaps having permanent pools capable of supporting aquatic life. Table Ge01 gives estimated length of permanent water as well as total length for individual third order and larger streams in the watershed.

The geology of the North Fork Watershed combined with an average precipitation of over 40 inches annually have created a karst landscape. Features of this landscape include losing streams, sinkholes, deeply intrenched valleys, and springs. It is believed that a large amount of water from the Bryant Creek Subwatershed is lost to the ground water system and emerges from Double and North Fork Springs. This is assumed due to the fact that low flows within the North Fork River are approximately twice those of Bryant Creek although the drainage areas of both are similar in size (MDNR 1994).

The Missouri Department of Natural Resources (1996a) has designated approximately 177 miles of streams within the watershed as "losing" (Table Ge03). Figure Ge06 shows losing streams within the North Fork Watershed as well as smaller streams that drain into these. These smaller streams are included because, although not officially designated as losing, they flow into losing stream reaches and thus also contribute to the loss of surface water to the ground water system. These losing streams, as well as sinkholes, recharge many springs within the watershed as well as some outside of the watershed including Mammoth Spring within the Spring River Watershed in Arkansas. This has been confirmed by several ground water dye tracings performed by the U.S. Forest Service and Missouri Department of Natural Resources between 1971 and 1989 (Figure Ge06; MDNR 1996b). These traces indicate that Hodgson Mill Spring, Double (Rainbow) Spring, and North Fork Spring, receive a portion of their recharge from losing streams in the Upper Gasconade Watershed including Wolf Creek, Fry Creek, and Lick Fork. This ground water travels a maximum linear horizontal distance of 38.9 miles and drops a maximum vertical distance of 655 feet between the tributaries of the Upper Gasconade and the aforementioned springs. These springs are also recharged by sinkholes and losing streams within the North Fork Watershed itself. This data would indicate that North Fork, Hodgson Mill, and Double (Rainbow) Springs are the outlet of a vast ground water system. Heavy growths of algae in North Fork and Double Spring suggest the existence of nutrient rich waters within the recharge area of these springs (MDNR 1994). Waste water from the Mansfield Waste Water Treatment Plant is discharged into a tributary of Fry Creek which, itself, is a tributary of Wolf Creek. As stated previously, water from both streams emerges from Double, North Fork, and Hodgson Mill Springs. The boundary between the Gasconade and the North Fork Watersheds is part of the major boundary between rivers within the Missouri River Drainage and the White River Basin. Groundwater travel across this boundary thus illustrates the common contrast between surface and groundwater movement.

Within the North Fork Watershed there are 283 springs as determined from United States Geological Survey 7.5 minute topographical maps. Vineyard and Feder (1974) list discharges for 16 of these springs (Figure Ge07 and Table Ge04). The two largest springs within the watershed are Double (Rainbow) and North Fork Springs, which emerge close together on the lower North Fork River. These have a combined flow of nearly 200 cfs. Hodgson Mill Spring is the third largest spring in the watershed with an average flow of 36 cfs. As discussed earlier all three springs appear to have the same recharge area. In addition five other springs within the watershed have average discharges greater than 10 cfs (Vineyard and Feder

1974).

Base flows to streams are well maintained during dry periods within the North Fork Watershed. The watershed is second only to the Current River Watershed in the size of its base flow (MDNR 1994). A comparison of base flows from watersheds of differing sizes is accomplished by comparing drainage area to low flow ratios (as given by MDNR 1994) of streams surrounding the watershed. The North Fork ranks second to the Current River at 4.5 square miles for every cubic feet per second (cfs) of flow. The Current river has the lowest ratio at 2.6:1. The James River has the highest ratio at 32.3:1

Drainage Area

The drainage area of the North Fork Watershed is 1389 square miles or 888,928 acres. The North Fork Watershed is divided into 6 eleven digit hydrologic units(HU). These are further divided into smaller fourteen digit hydrologic units of which there are 30 within the watershed (Figure Ge08). The largest eleven digit HU in the watershed is the Lower North Fork Unit with an area of 358 square miles (228,822 acres). The largest fourteen digit HU is 11010006040004 with an area of 84 square miles (53,731 acres). It is located in the Lower Bryant eleven digit hydrologic unit. In karst regions, such as the North Fork Watershed, it is of equal importance to understand the ground water divisions. As discussed earlier, It is believed that the recharge area of Double (Rainbow) and North Fork Springs include portions of the drainage area of Bryant Creek (MDNR 1994). In addition, dye traces indicate the watershed not only receives ground water from at least one other watershed but also loses ground water to at least one neighboring watershed (MDNR 1996b).

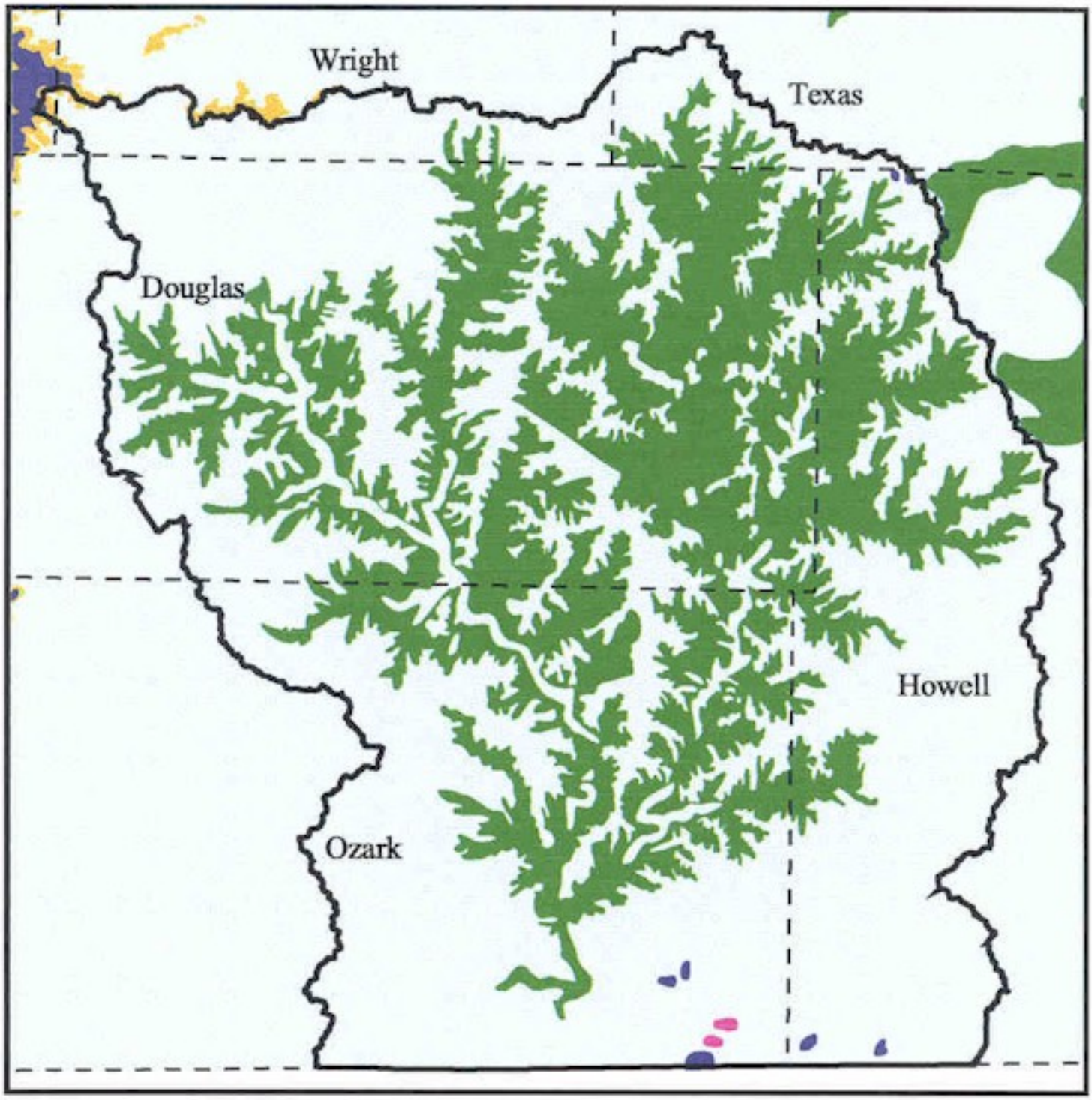
Channel Gradient

Channel gradient was determined using data digitized from USGS 7.5 minute topographic maps for all fourth order and larger streams within the North Fork River Watershed. Composite gradient plots were constructed for all fifth order and larger streams within the watershed. Channel gradient graphs were constructed using the formula (CHANGE IN ELEVATION/CHANGE IN MILEAGE). While this formula proved adequate to graph the actual gradient of a stream, it was not used to calculate the average gradient for the entire stream. This is due to the fact that gradients were determined at increments of 20 ft changes in elevation and not mileage. Therefore a single gradient value could have a disproportionate effect on the average gradient of an entire stream if an average of all calculated gradients were used to represent the average gradient of an entire stream. For this reason, average gradient as well as gradient for order (Strahler) was determined using the formula (TOTAL CHANGE IN ELEVATION/TOTAL CHANGE IN MILEAGE). This formula yielded a linear graph which, while it did not yield a realistic graphic representation, did produce an adequate calculation of average gradient for an entire stream. Average gradients, as well as gradient for strahler order of streams fifth order (horton) and larger are given in Table Ge05. The North Fork River has an average gradient of 12.8 feet/mile. While Bryant Creek has an average gradient of 14.1 feet/mile.

Figure Ge01.

North Fork Watershed

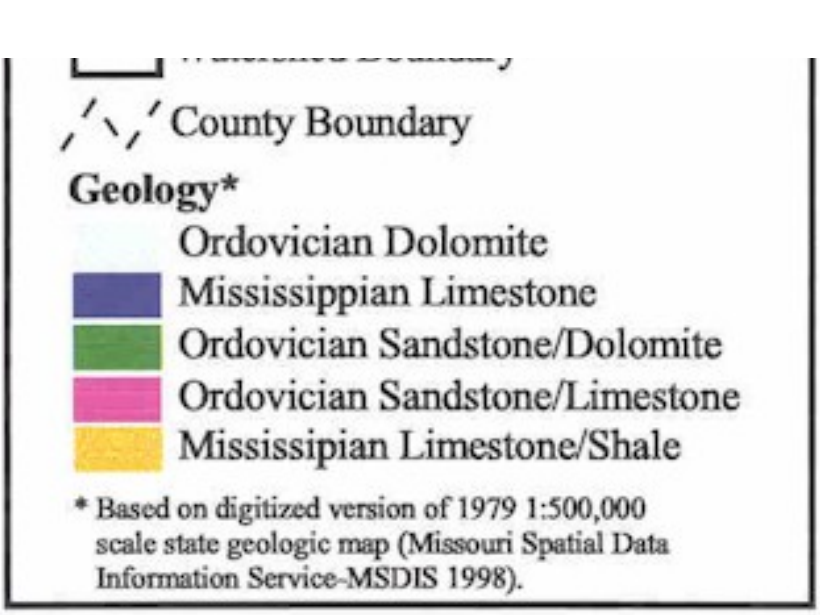
Geology



5 0 5 10 Miles

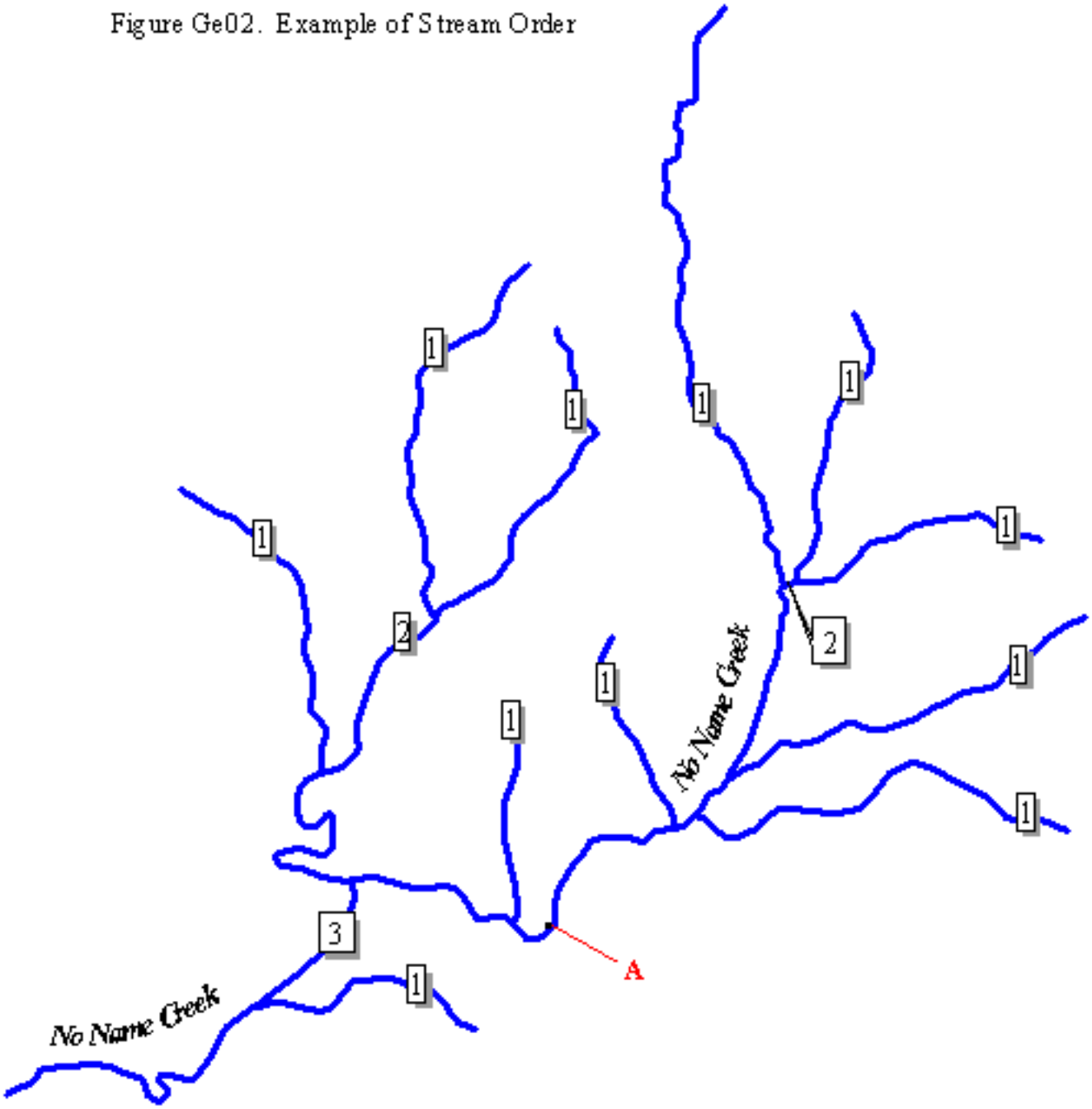
Legend

Watershed Boundary


County Boundary
Geology*
Ordovician Dolomite
Mississippian Limestone
Ordovician Sandstone/Dolomite
Ordovician Sandstone/Limestone
Mississipian Limestone/Shale
* Based on digitized version of 1979 1:500,000 scale state geologic map (Missouri Spatial Data Information Service-MSDIS 1998).


N

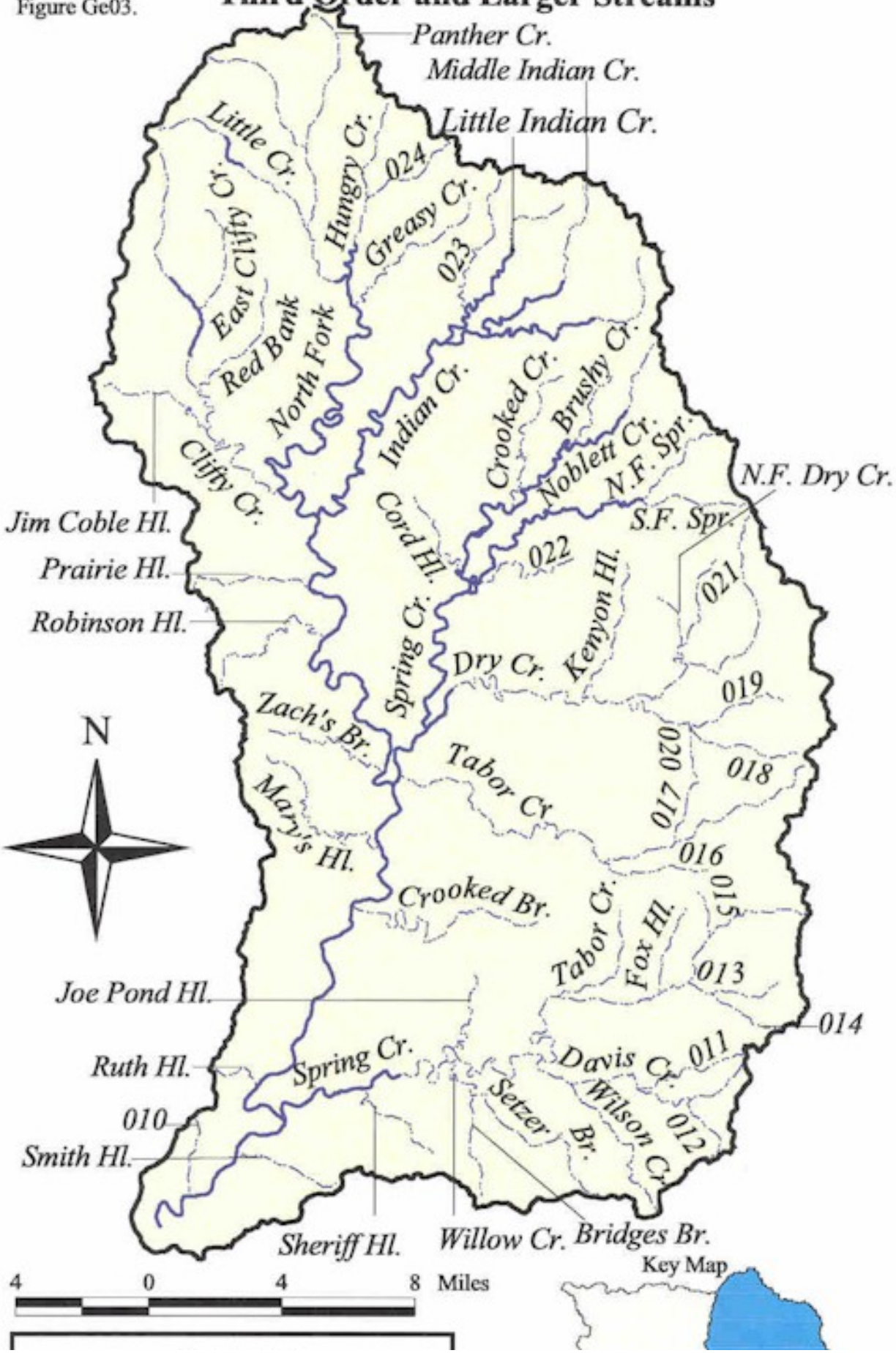
Figure Ge02. Example of Stream Order



The stream segment at Point A has a Horton order of 3 and a Strahler order of 2.

Upper North Fork
Third Order and Larger Streams

Figure Ge03.



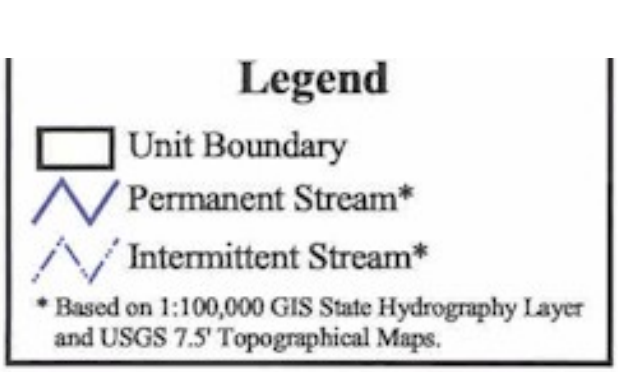
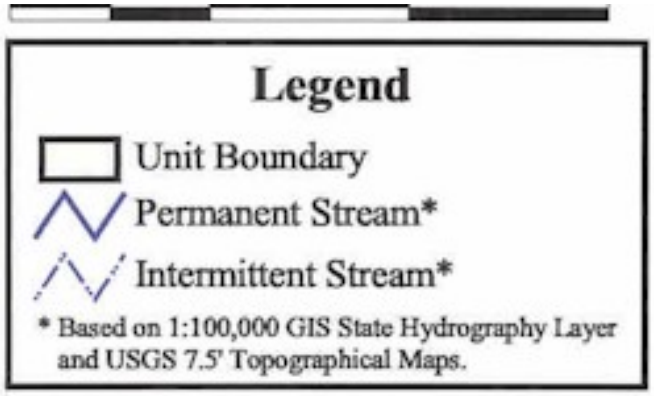

Legend
Unit Boundary
Permanent Stream*
Intermittent Stream*
* Based on 1:100,000 GIS State Hydrography Layer and USGS 7.5' Topographical Maps.

Figure Ge04.

Bryant Creek

Third Order and Larger Streams

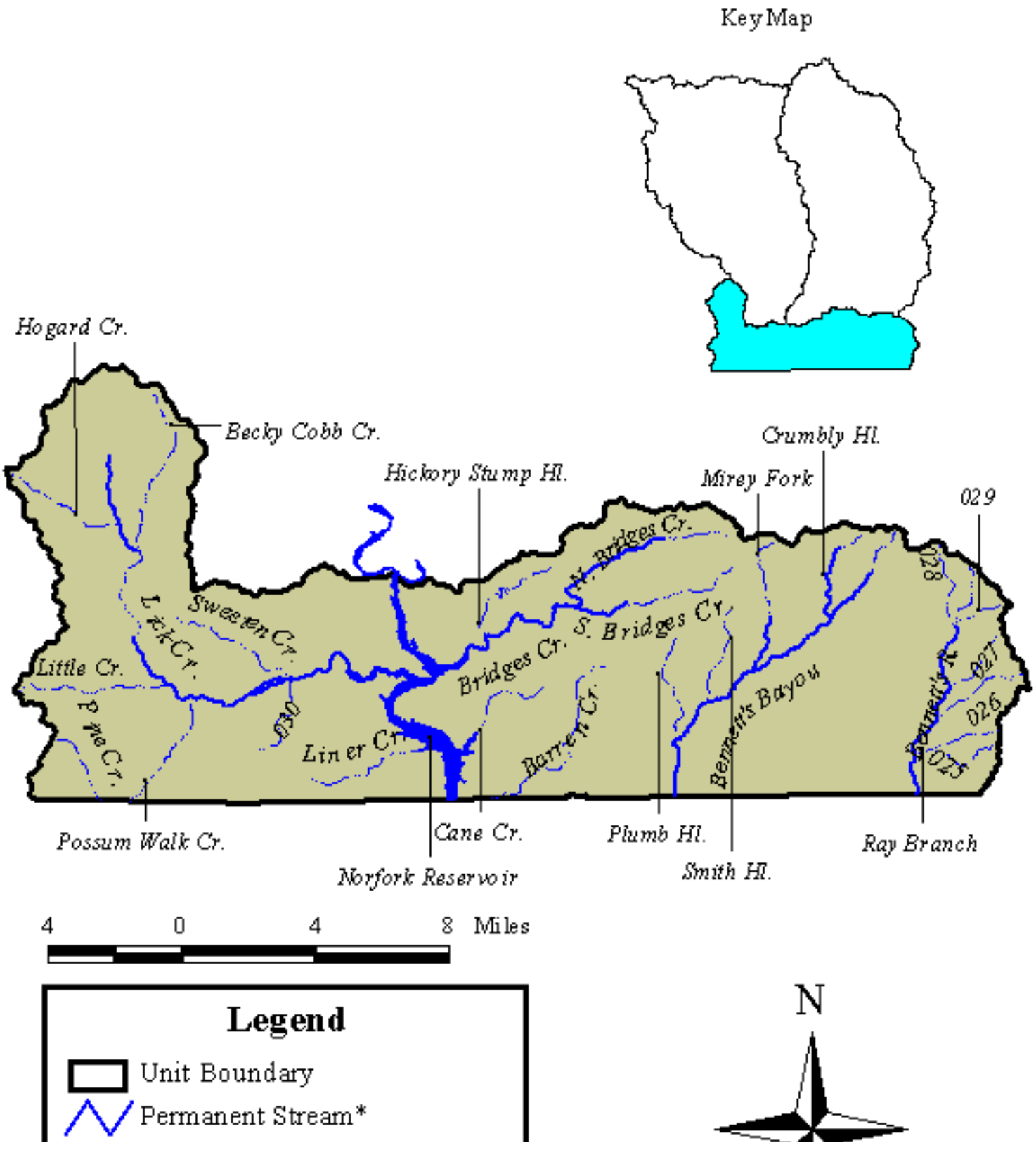

Legend
Unit Boundary
Permanent Stream*
Intermittent Stream*
* Based on 1:100,000 GIS State Hydrography Layer and USGS 7.5' Topographical Maps.


N

Figure Ge05.

Norfork Reservoir

Third Order and Larger Streams



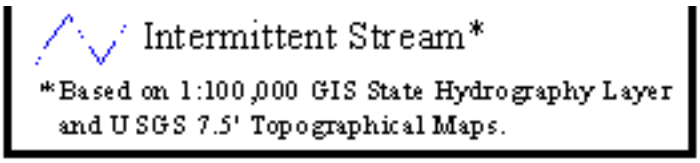
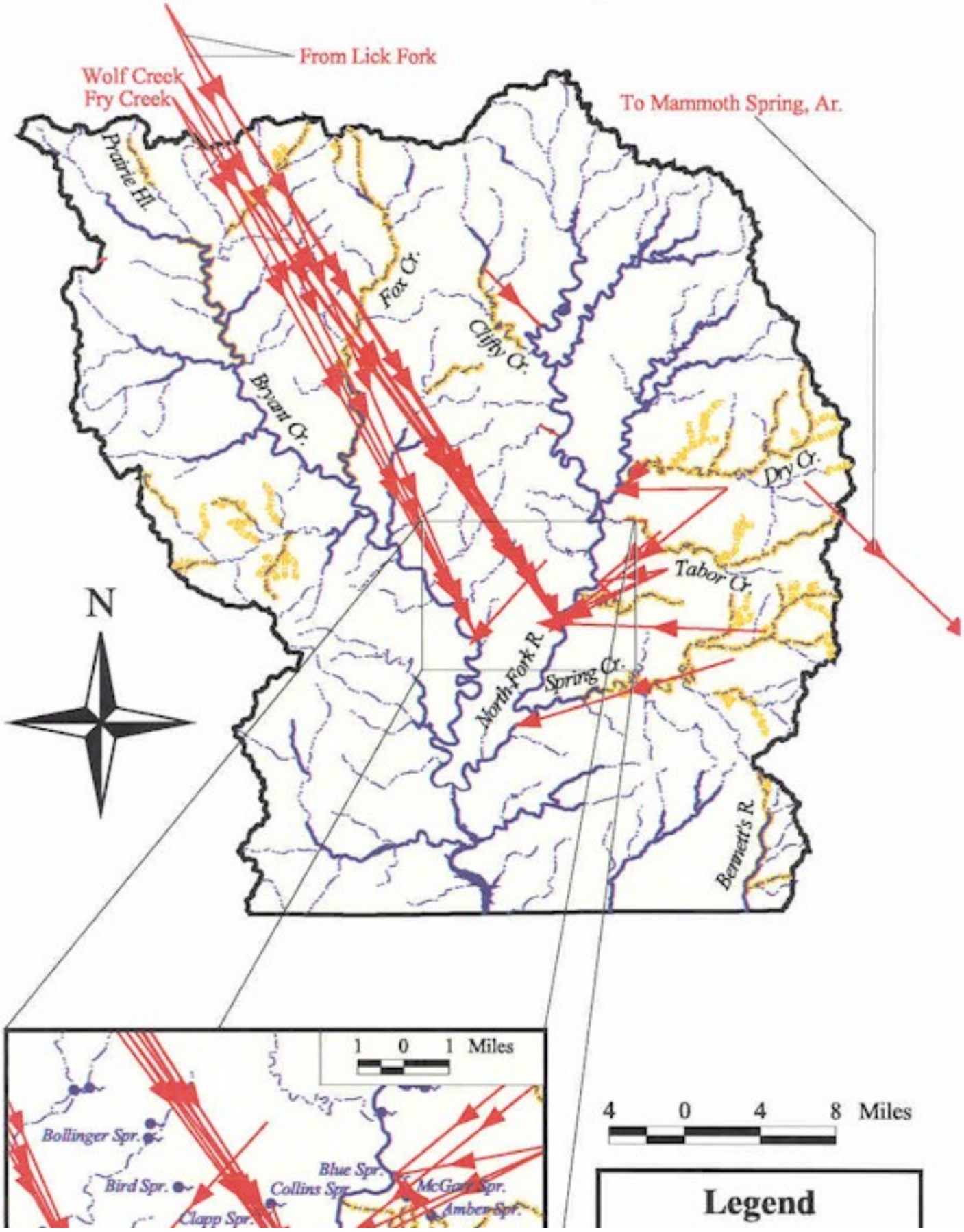
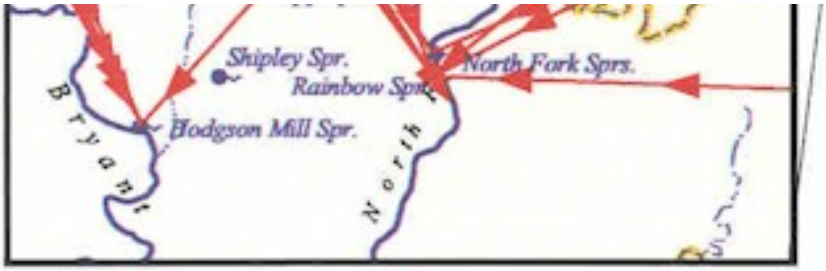

Intermittent Stream*
*Based on 1:100,000 GIS State Hydrography Layer and USGS 7.5' Topographical Maps.

Figure Ge06.

North Fork Watershed
Ground Water Transport





Watershed Boundary

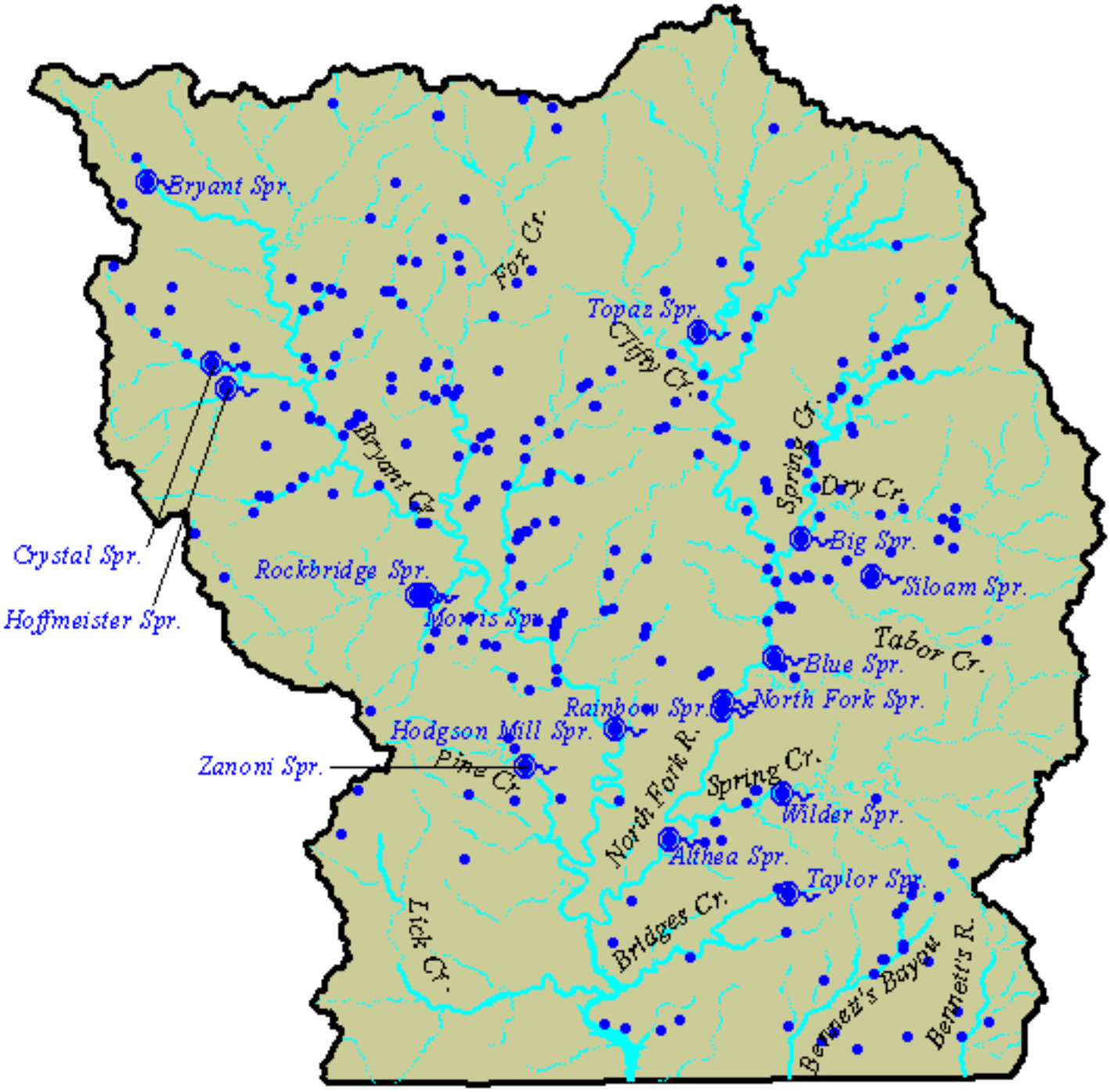
Dye Trace
(MDNR 1996b)

Losing Stream

Figure Ge07.

North Fork Watershed

Springs



4 0 4 Miles

Legend

Watershed Boundary

N

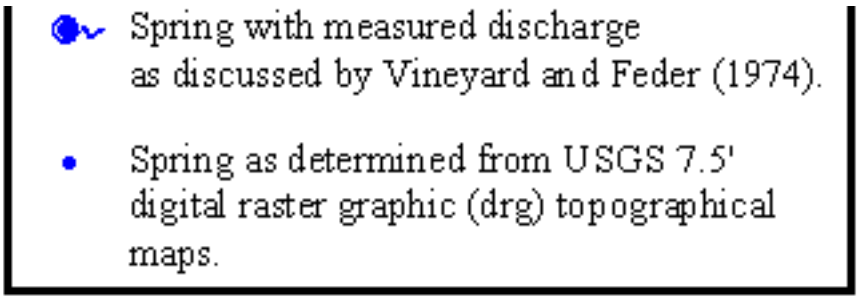
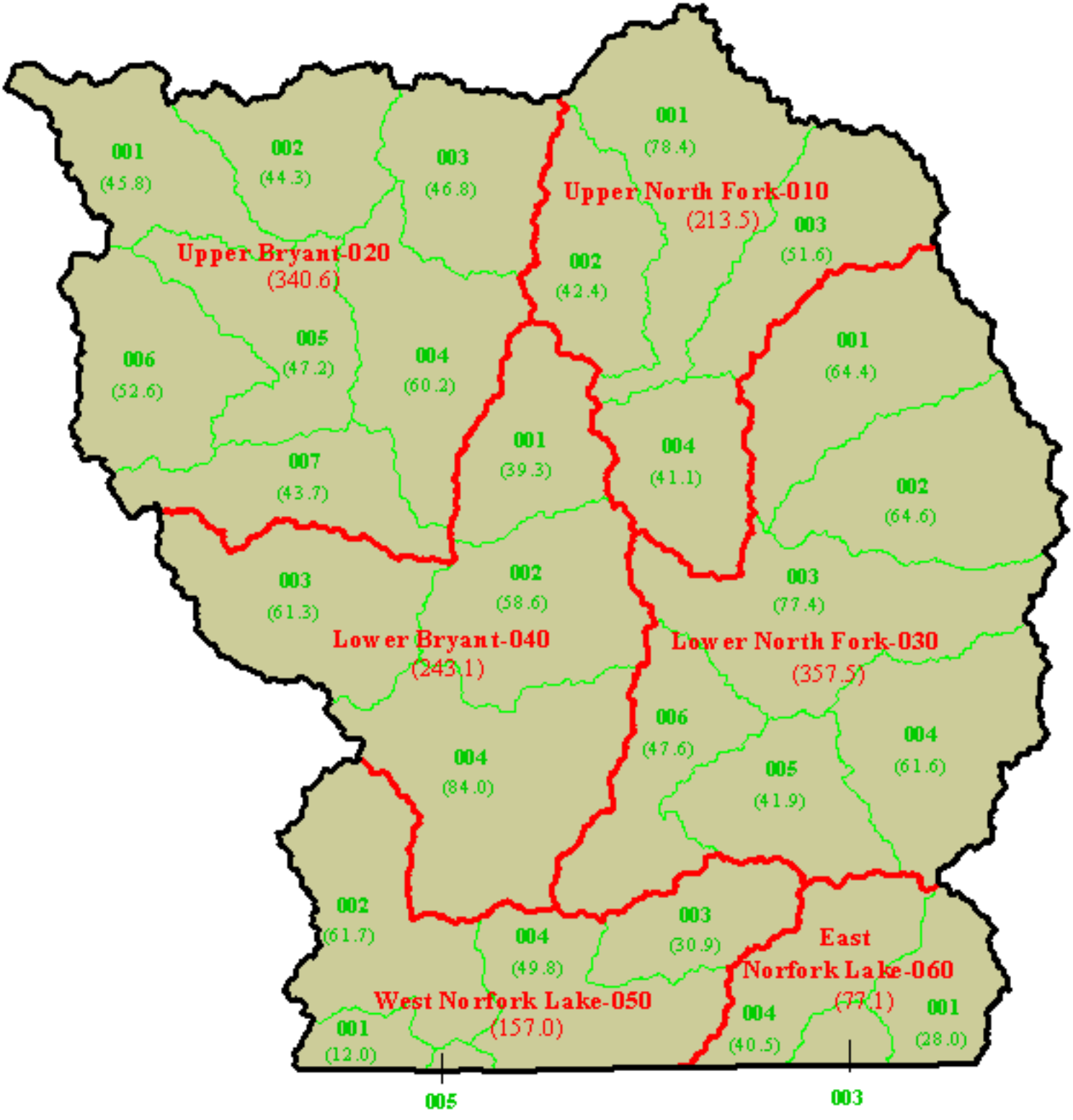

Spring with measured discharge
as discussed by Vineyard and Feder (1974).
Spring as determined from USGS 7.5'
digital raster graphic (drg) topographical
maps.

Figure Ge08.

North Fork Watershed
Hydrologic Units



4 0 4 Miles

Legend

- North Fork Watershed Boundary
- Eleven Digit Hydrologic Unit Boundary
- Fourteen Digit Hydrologic Unit Boundary
- 000 Eleven Digit Hydrologic Unit Code(last three digits)
- (00.0) Eleven Digit Hydrologic Unit Area (square miles)
- 000 Fourteen Digit Hydrologic Unit Code (last three digits)
- (00.0) Fourteen Digit Hydrologic Unit Area (square miles)

Figure Ge09.

Gradient Plot for Bennett's River
&
Major Tributary

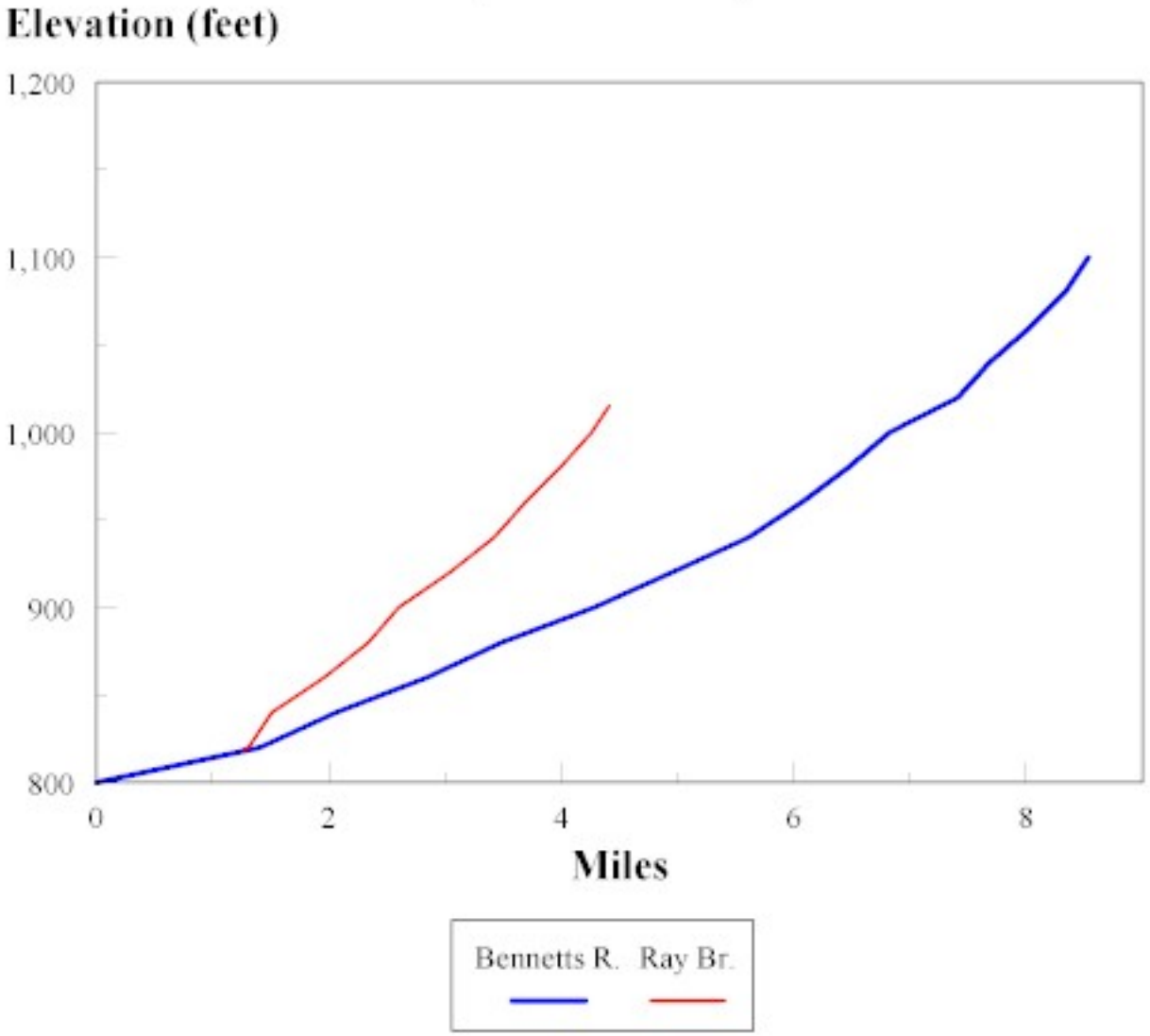


Figure Ge10.

Gradient Plot for Bryant Creek
&
Major Tributaries

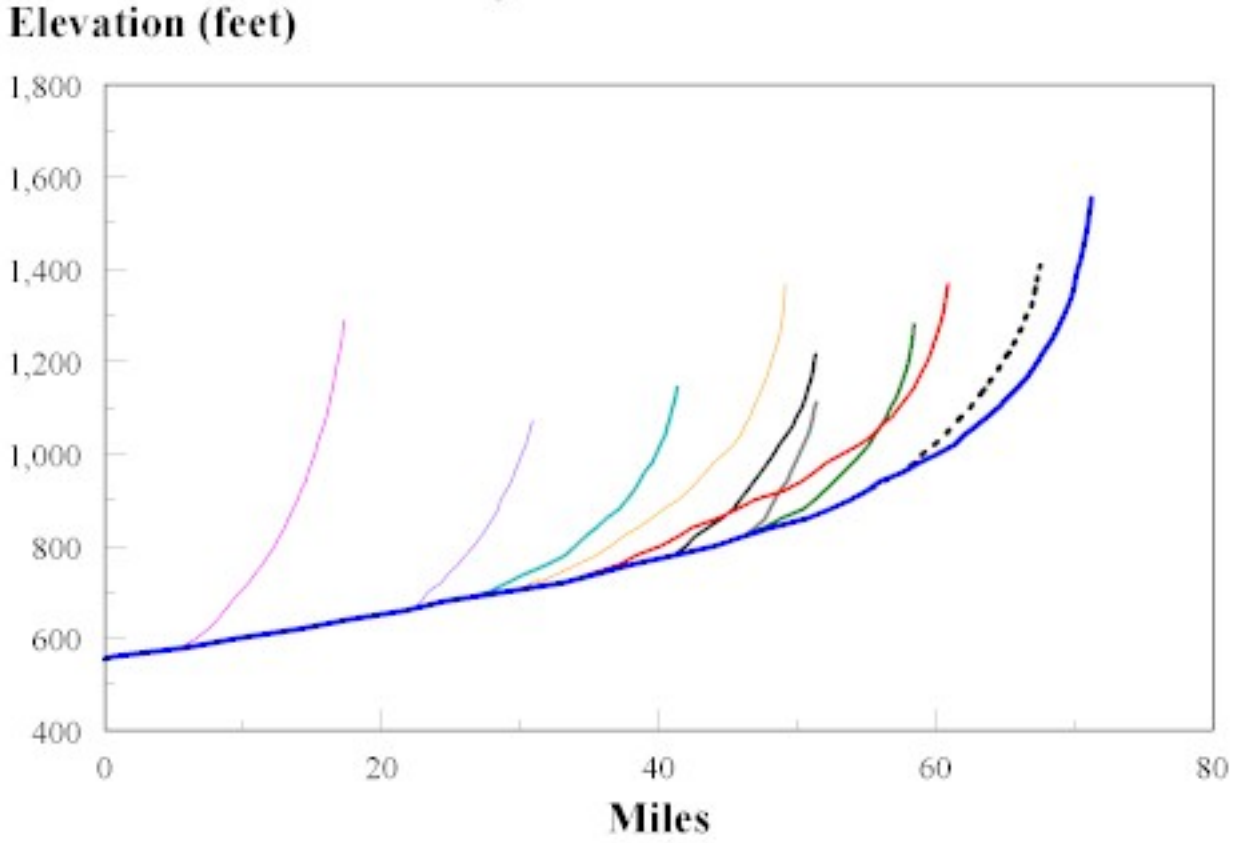


Figure Ge11.

Gradient Plot for Caney Creek
&
Major Tributary

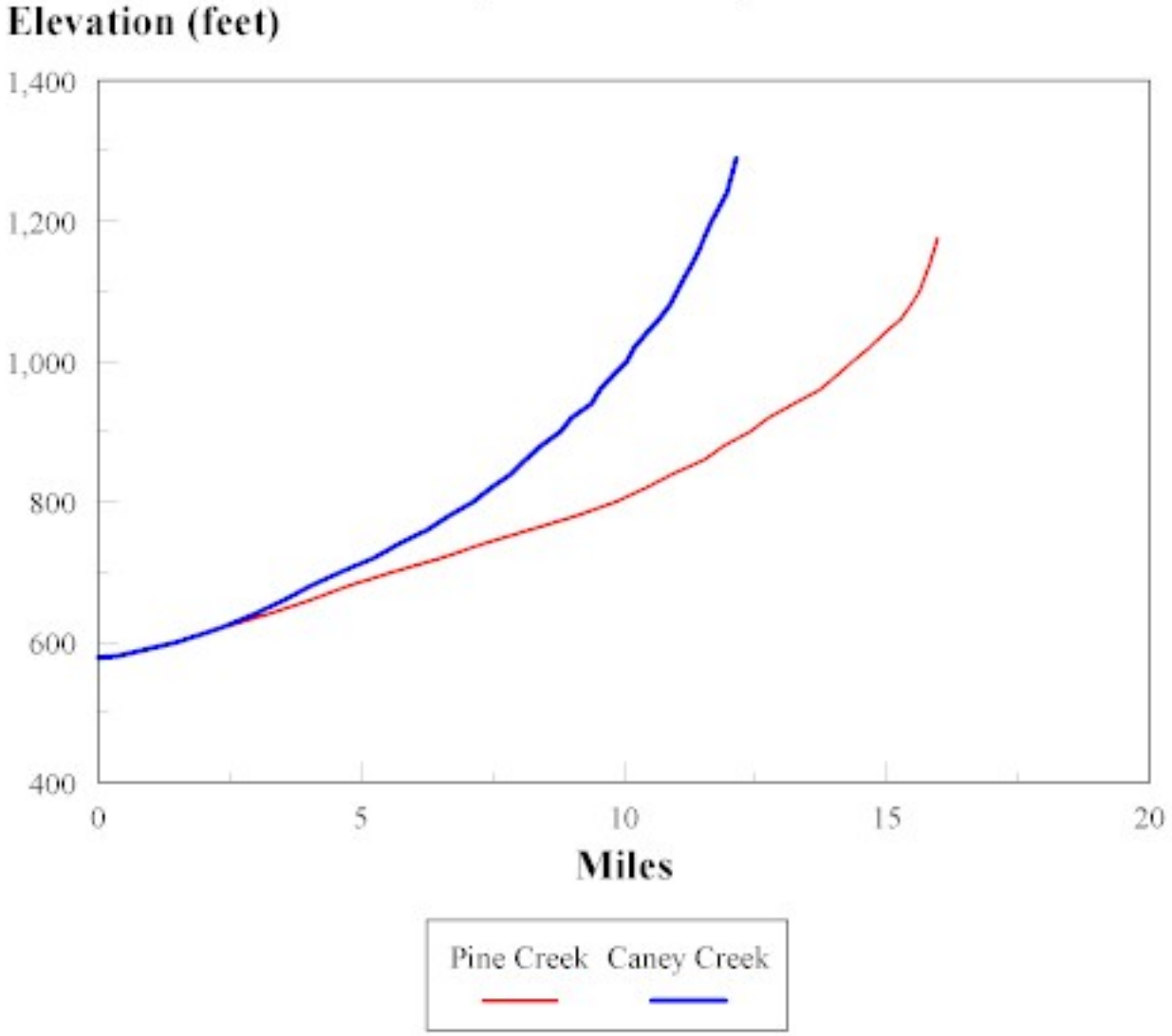


Figure Ge12.

Gradient Plot for Dry Creek

(Bryant Subwatershed)

&

Major Tributaries

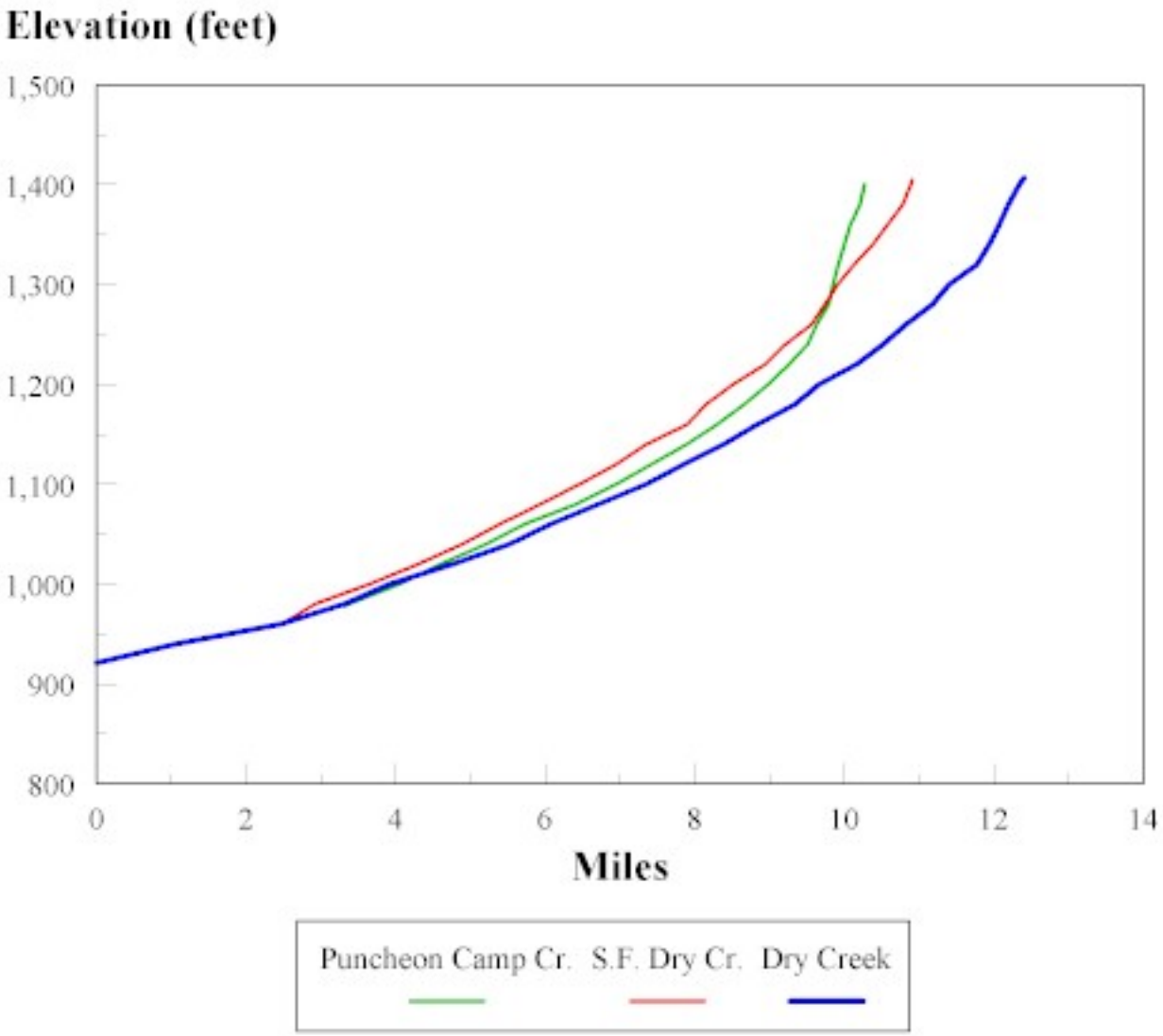


Figure Ge13.

Gradient Plot for Dry Creek

(Spring Creek Subwatershed)

&

Major Tributaries

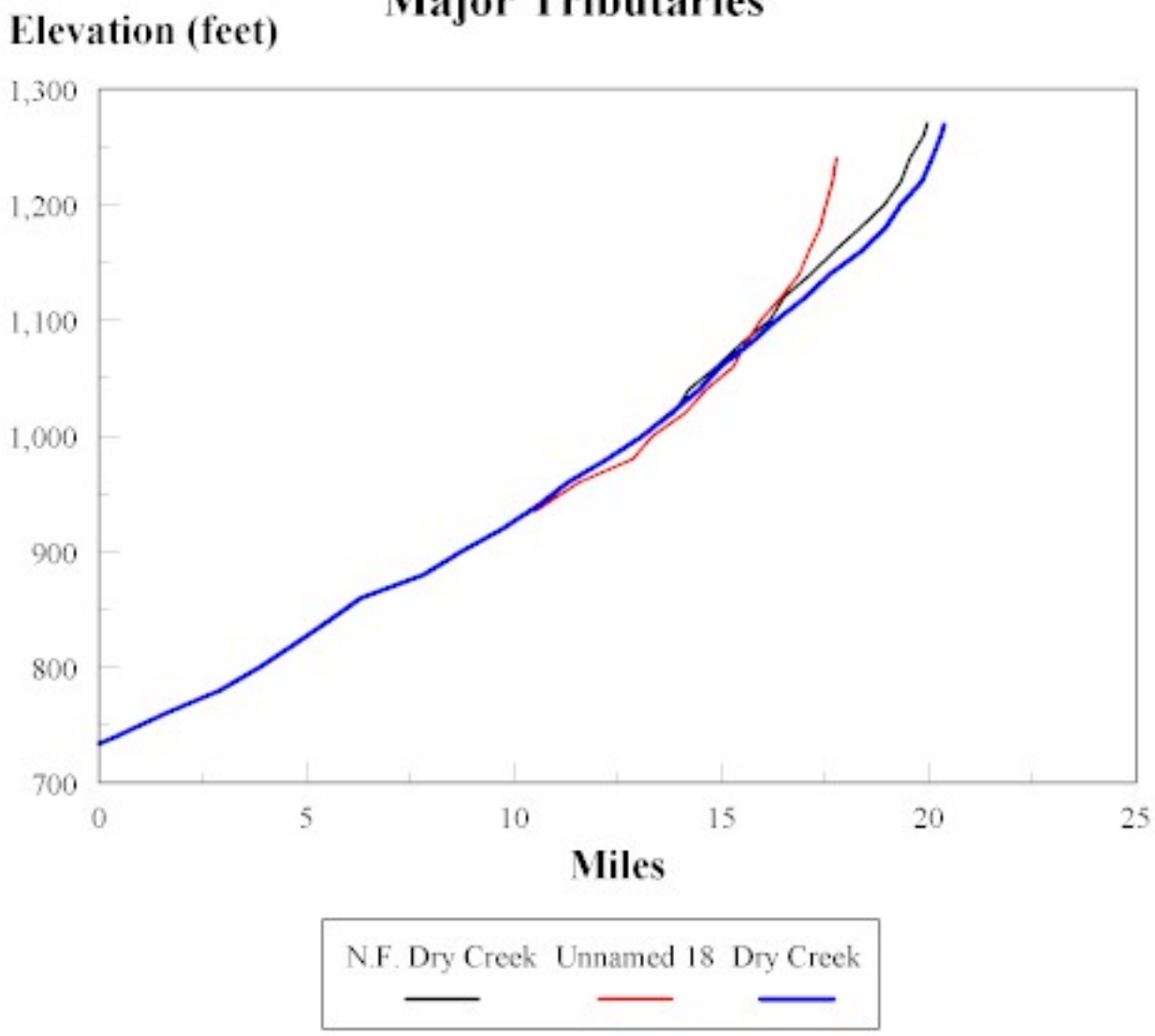


Figure Ge14.

Gradient Plot for Fox Creek
&
Major Tributary

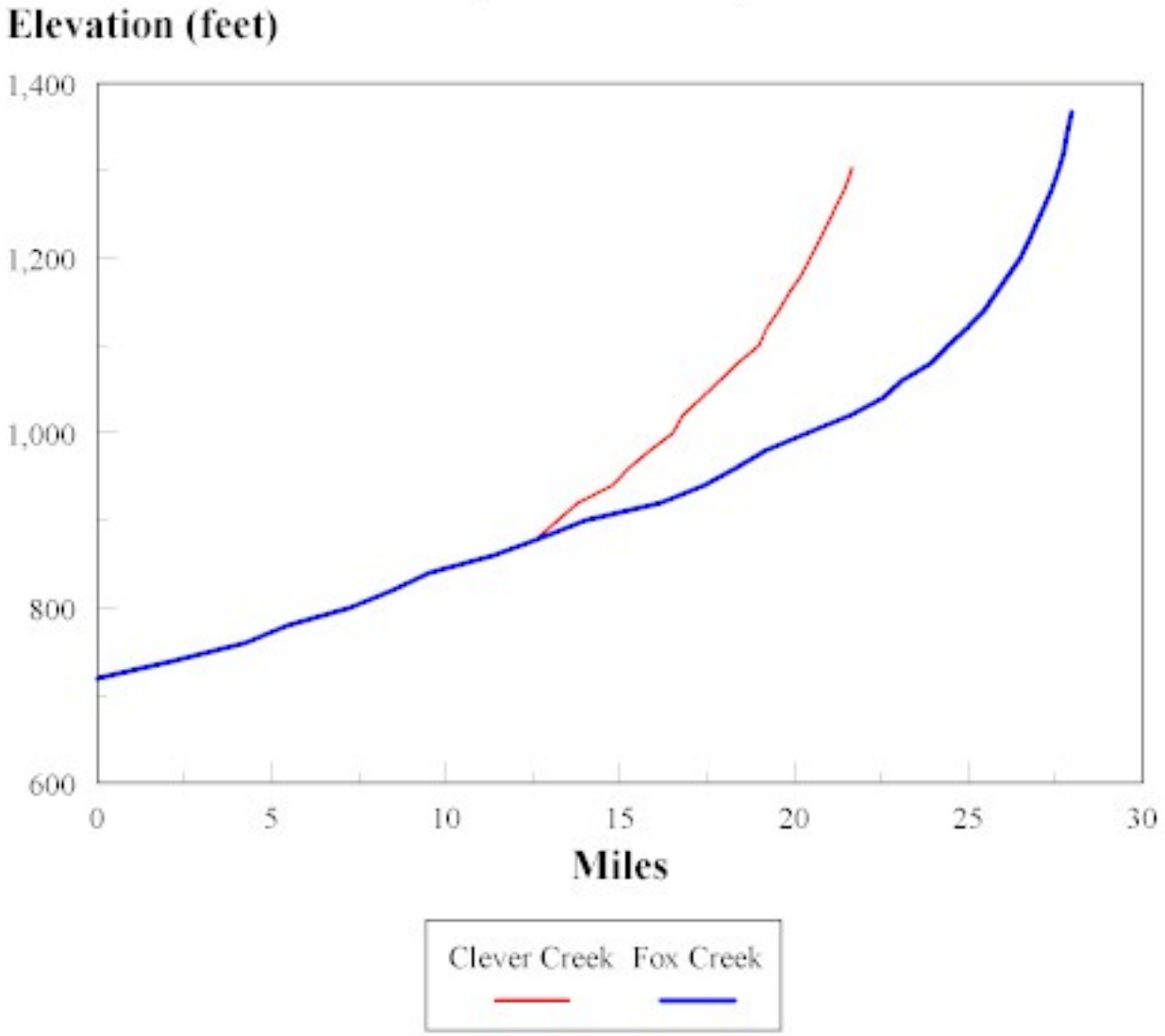


Figure Ge15.

Gradient Plot for Hunter Creek
&
Major Tributary

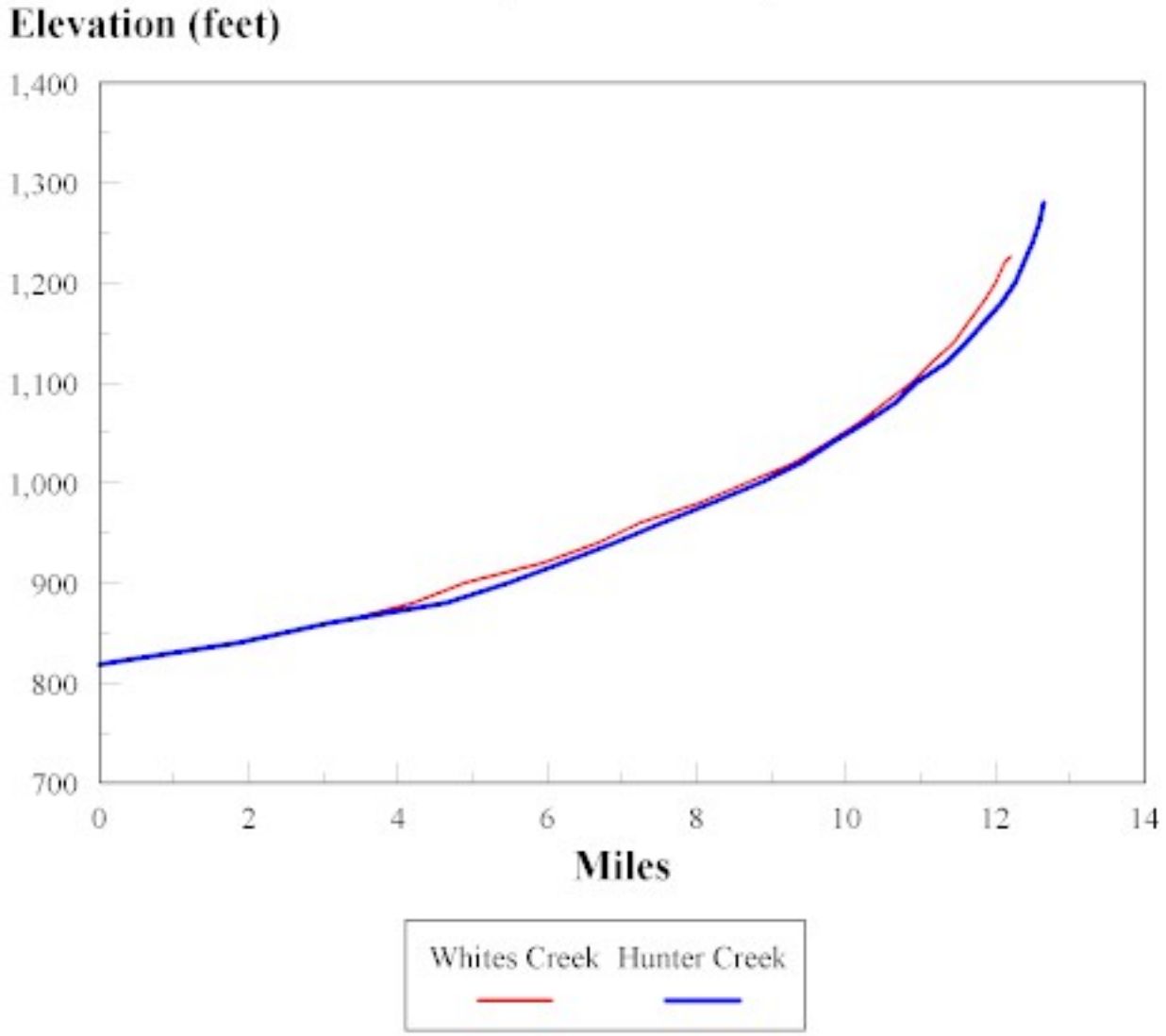


Figure Ge16.

Gradient Plot for Indian Creek
&
Major Tributary

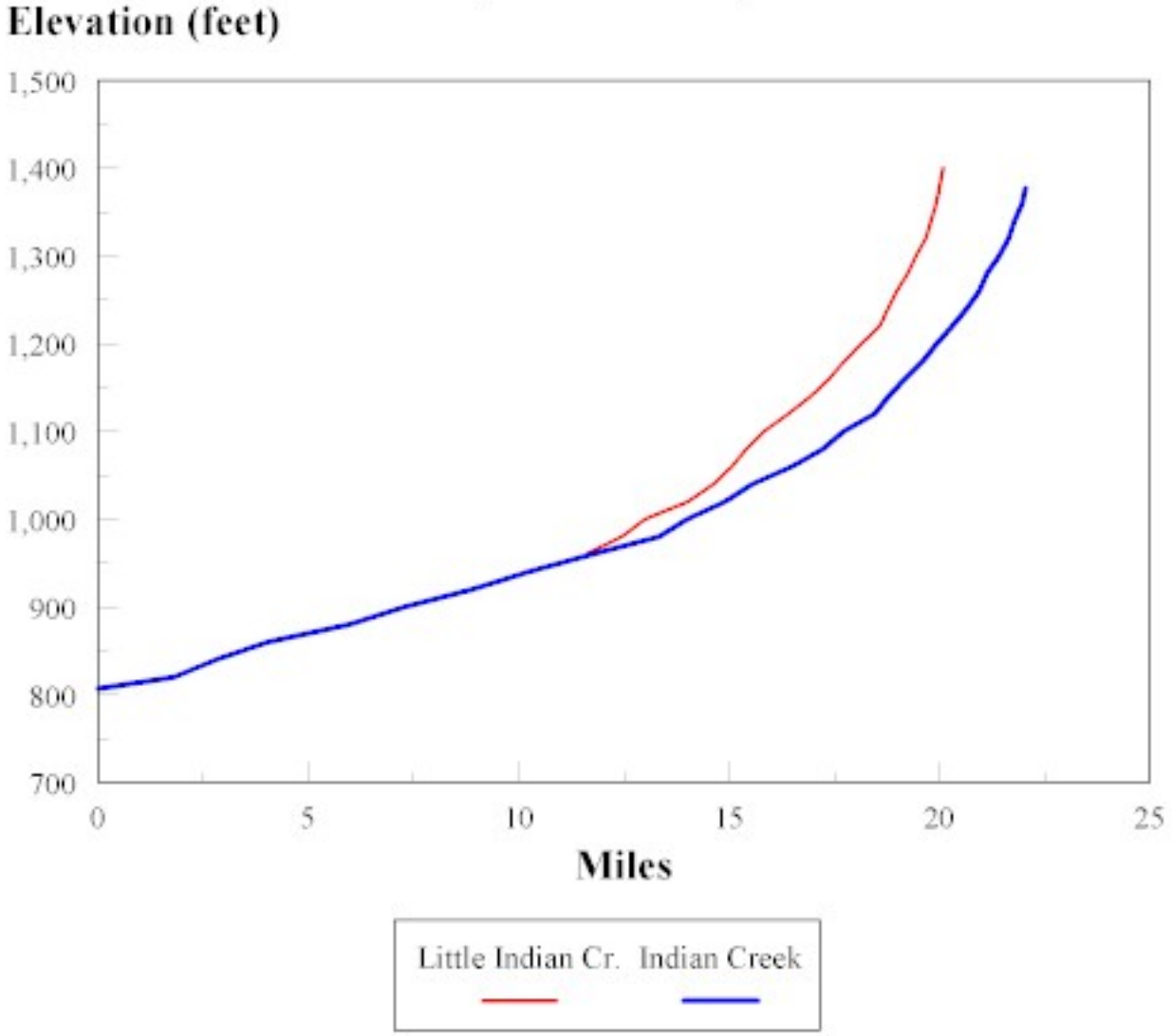


Figure Ge17.

Gradient Plot for Lick Creek
&
Major Tributary

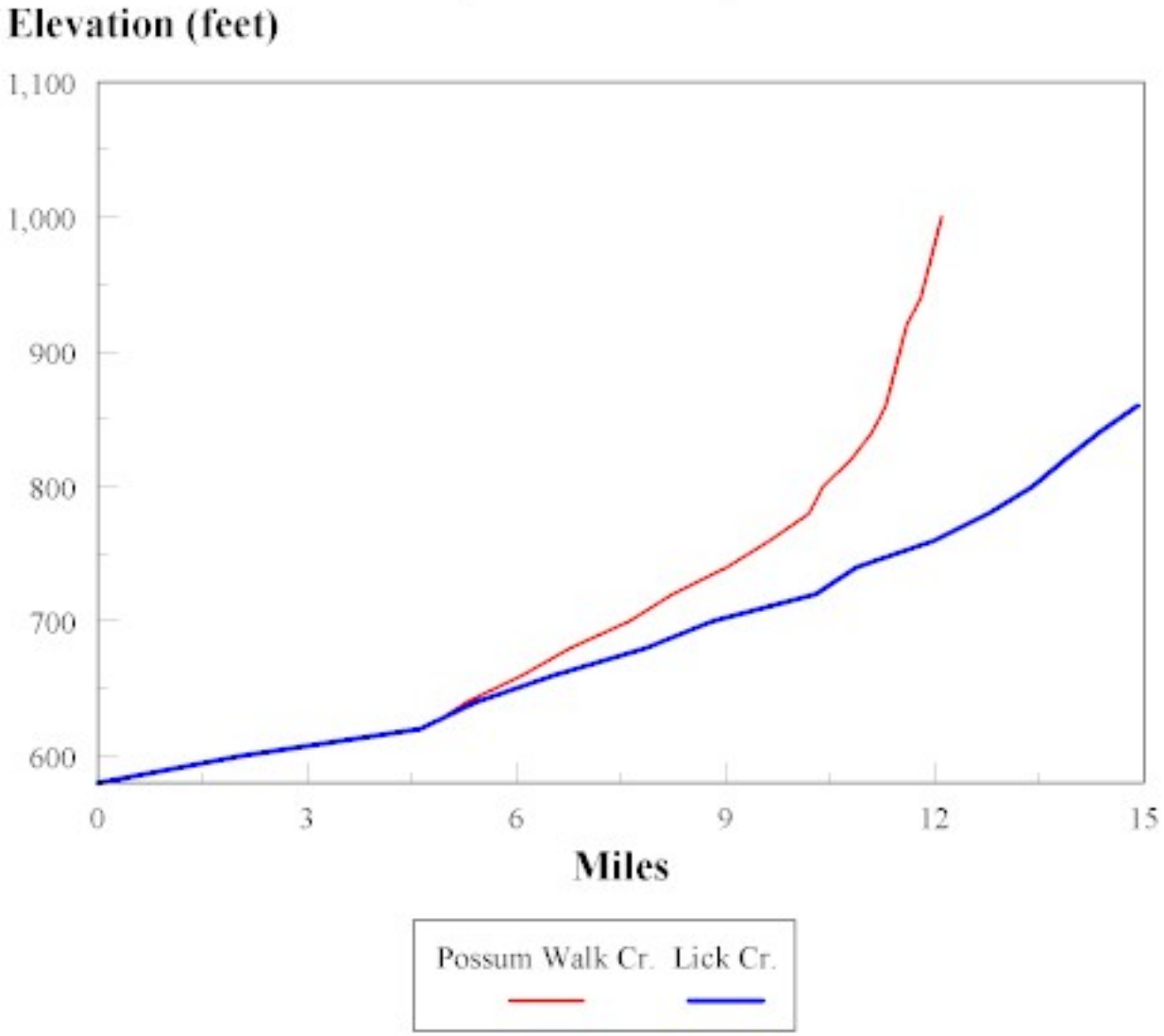


Figure Ge18.

Gradient Plot for The North Fork River
&
Major Tributaries

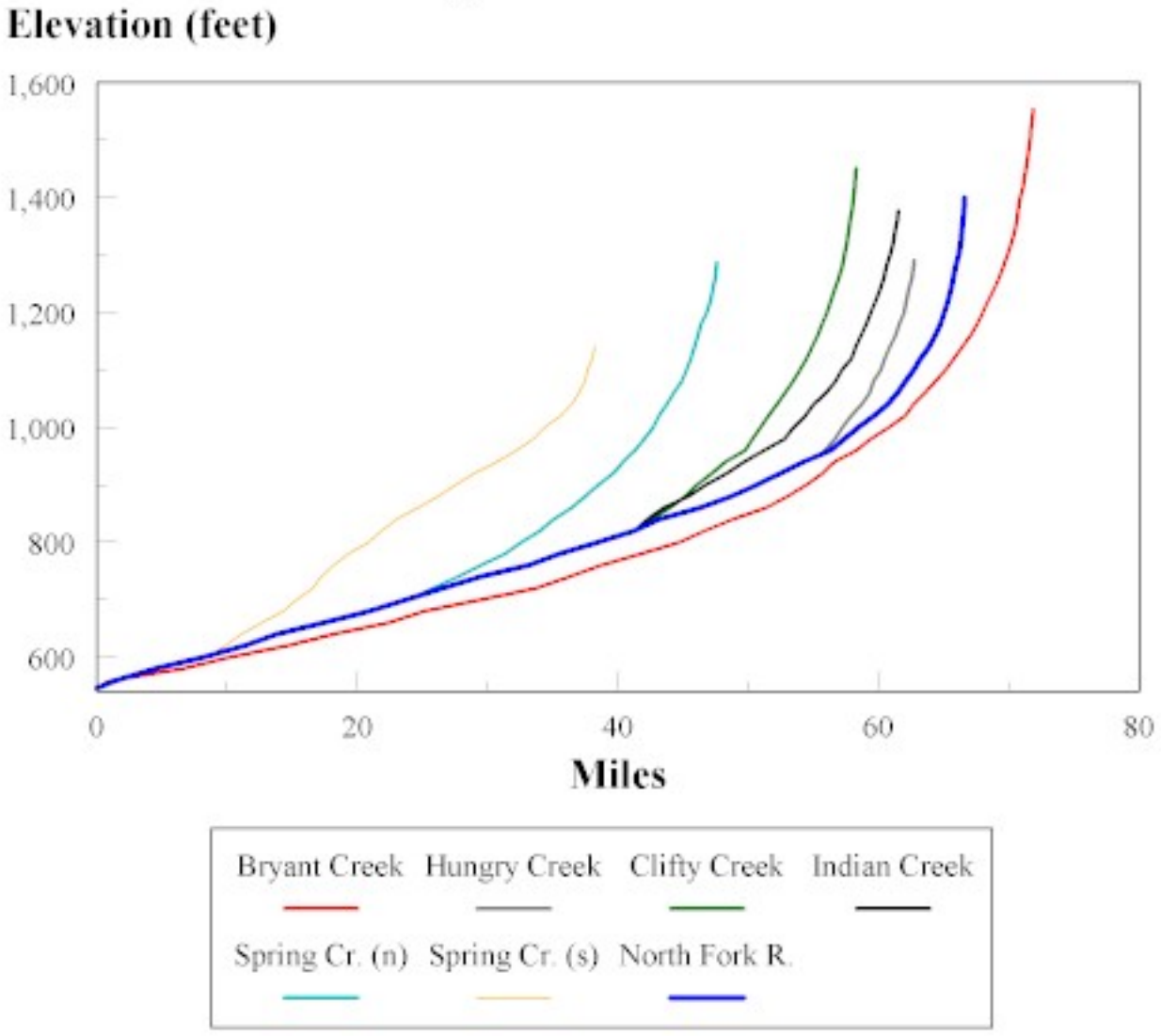


Figure Ge19.

Gradient Plot for Spring Creek (North)
&
Major Tributaries

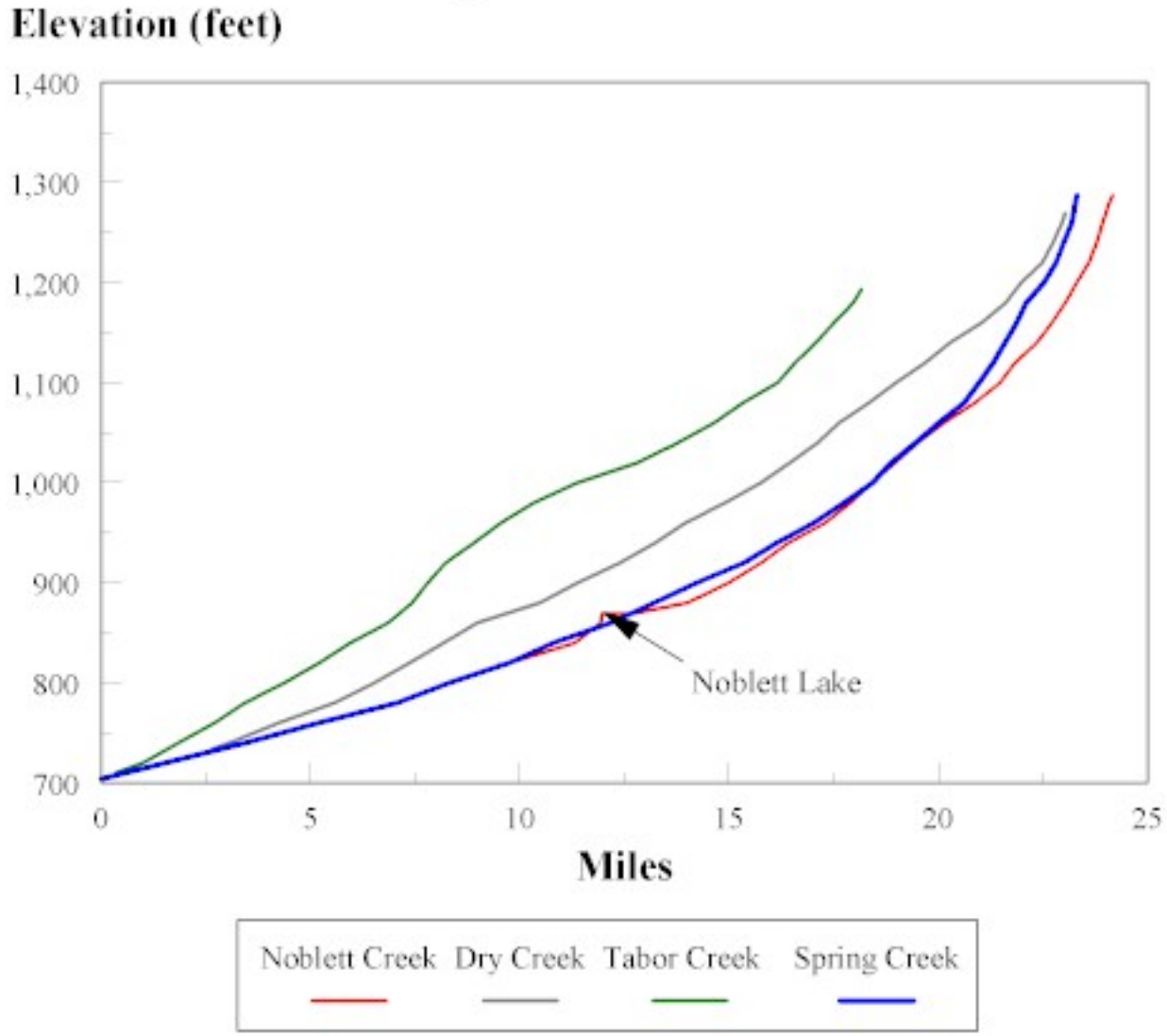


Figure Ge20.

Gradient Plot for Spring Creek (South)
&
Major Tributaries

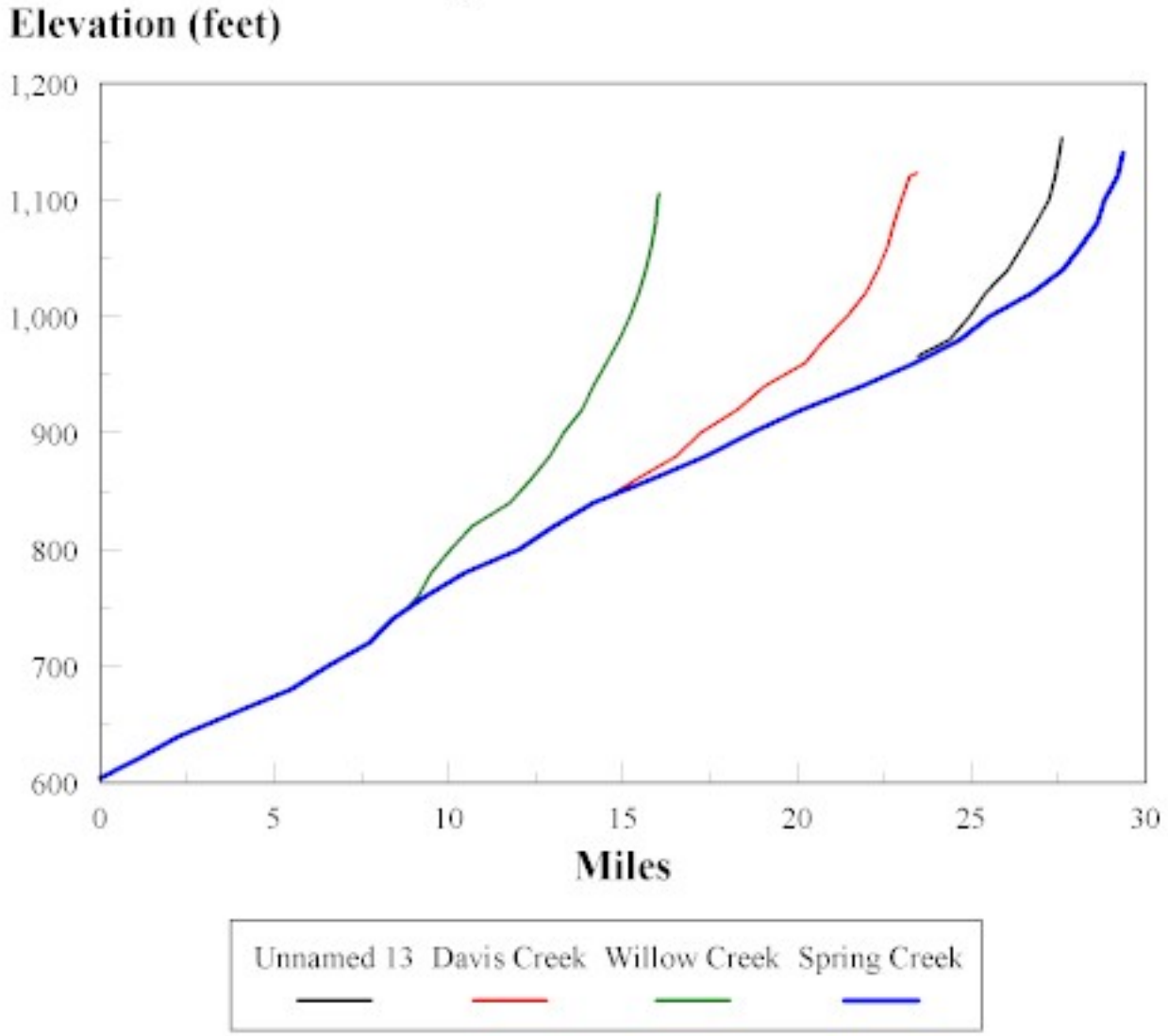


Table Ge01. Third order and larger streams of the North Fork Watershed.

Stream Name	Order	USGS 7.5' Quad at Stream Mouth	Name and Order Recieving Stream	Length	
				P	T
Norfork Lake	N/A	N/A	N/A	N/A	N/A
Bennett's River	5*	Gamaliel, AR	Norfork Lake	5.9	8.5
Ray Branch	4	Caufield	Bennetts R. 5*	0	3.1
NFW 025	3	Caufield	Ray Br. 4	0	2.5
NFW026	3	Moody	Bennetts R. 4	0	3.1
NFW027	3	Moody	Bennetts R. 4	0	2.5
NFW028	3	Moody	Bennetts R. 4	0	2.9
NFW029	3	Moody	Bennetts R. 4	0	1.6
Bennett's Bayou	4*	Gamaliel, AR	Norfork Lake	10.2	17.4
Plumb Hollow	3	Bakersfield	Bennetts Bayou 4	0	3.6
Smith Hollow	3	Caufield	Bennetts Bayou 4	0	3.3
Mirey Fork	3	Caufield	Bennetts Bayou 4	1.9	4.5
Crumby Hollow	3	Caufield	Bennetts Bayou 4	2.5	3.3
Barren Creek	3	Gamaliel, AR	Norfork Lake	0	6.6
Cane Creek	3	Udall	Norfork Lake	0	3.2
Liner Creek	3	Udall	Norfork Lake	0	1.4
Lick Creek	5	Udall	Norfork Lake	12.9	14.9
Sweeten Creek	3	Udall	Lick Cr. 5	0	4.3

NFW030	3	Udall	Lick Cr. 5	0	2.9
Possum Walk Cr.	4	Gainesville	Lick Cr. 5	0	7.1
Pine Creek	3*	Midway, AR	Possum Walk Cr. 4	0	2.5

P-Permanent Stream Miles (Based on USGS 7.5' topographical maps)

T-Total Stream Miles (Digitized from USGS 7.5' topographical maps for 4th order and larger streams. Determined from 1:100,000 scale GIS hydrography coverage for 3rd order streams.)

Table Ge01. Third order and larger streams of the North Fork Watershed.

Stream Name	Order	USGS 7.5' Quad at Stream Mouth	Name and Order Recieving Stream	Length	
				P	T
Little Creek	3	Gainesville	Lick Cr. 4	0	4.7
Becky Cobb Creek	3	Gainesville	Lick Cr. 4	0	5.4
Hogard Creek	3	Gainesville	Lick Cr. 4	0	3.9
Bridges Creek	4	Udall	Norfork Lake	4.8	4.8
Hickory Stump Hol	3	Bakersfield	Bridges Cr. 4	0	4.1
S. Bridges Creek	3	Bakersfield	Bridges Cr. 4	1.8	5.4
N. Bridges Creek	3	Bakersfield	Bridges Cr. 4	4.4	6.4
North Fork River	7	Udall	Norfork Lake	53.0	66.6
NFW010	3	Udall	North Fork R. 7	0	2.8
Smith Hollow	3	Cureall NW	North Fork R. 7	0	3.4
Spring Creek	5	Cureall NW	North Fork R. 7	5.1	29.4
Sheriff Hollow	3	Cureall NW	Spring Cr. 5	0	3.9

Willow Creek	4	Pottersville	Spring Cr. 5	0	2.5
Setzer Branch	3	Pottersville	Willow Cr. 4	0	6.5
Bridges Branch	3	Pottersville	Willow Cr. 4	0	3.3
Joe Pond Hollow	3	Pottersville	Spring Cr. 5	0	3.4
Davis Creek	4	Pottersville	Spring Cr. 5	0	8.8
Wilson Creek	3	Pottersville	Davis Cr. 4	0	5.5
NFW011	3	Pottersville	Davis Cr. 4	0	3.8
NFW012	3	South Fork	Davis Cr. 4	0	2.5
Tabor Creek	3	Pottersville	Spring Cr. 5	0	4.2

P-Permanent Stream Miles (Based on USGS 7.5' topographical maps)

T-Total Stream Miles (Digitized from USGS 7.5' topographical maps for 4th order and larger streams. Determined from 1:100,000 scale GIS hydrography coverage for 3rd order streams.)

Table Ge01. Third order and larger streams of the North Fork Watershed.

Stream Name	Order	USGS 7.5' Quad at Stream Mouth	Name and Order Recieving Stream	Length	
				P	T
Fox Hollow	3	Pottersville	Spring Cr. 5	0	2.9
NFW013	4	South Fork	Spring Cr. 5	0	4.1
NFW014	3	South Fork	NFW013	0	2.5
NFW015	3	South Fork	Spring Cr. 4	0	1.5
Ruth Hollow	3	Cureall NW	North Fork R. 7	0	1.9
Crooked Branch	3	Cureall NW	North Fork R. 7	0	6.1
Mary's Hollow	3	Dora	North Fork R. 7	0	7.7

Spring Creek	6	Dora	North Fork R. 7	18.1	18.1
Tabor Creek	4	Dora	Spring Cr. 6	0	17.8
NFW016	3	Siloam Springs	Tabor Cr. 4	0	3.6
NFW017	3	Pomona	Tabor Cr. 4	0	2.1
Dry Creek	5	Dora	Spring Cr. 6	1.6	20.4
Kenyon Hollow	3	Siloam Springs	Dry Cr. 5	0	5.1
NFW018	4	Siloam Springs	Dry Cr. 5	0	7.3
NFW019	3	Pomona	NFW018-4	0	3.6
NFW020	3	Pomona	NFW019-4	0	1.7
North Fork Dry Cr.	4	Pomona	Dry Cr. 4	0	6.7
NFW021	3	Pomona	Dry C.r 4	0	3.3
NFW022	3	Dyestone Mountain	Spring Cr. 4	0	4.3
N. Fork Spring Cr.	3	Dyestone Mountain	Spring Cr. 4	0	3.6
S. Fork Spring Cr.	3	Dyestone Mountain	Spring Cr. 4	0	3.5

P-Permanent Stream Miles (Based on USGS 7.5' topographical maps)

T-Total Stream Miles (Digitized from USGS 7.5' topographical maps for 4th order and larger streams. Determined from 1:100,000 scale GIS hydrography coverage for 3rd order streams.)

Table Ge01. Third order and larger streams of the North Fork Watershed.

Stream Name	Order	USGS 7.5' Quad at Stream Mouth	Name and Order Recieving Stream	Length	
				P	T
Noblett Creek	4	Dyestone Mountain	Spring Cr. 5	12.3	14.7

Cord Hollow	3	Dyestone Mountain	Noblett Cr. 4	0	3.5
Crooked Creek	3	Dyestone Mountain	Noblett Cr. 4	0	6.1
Brushy Creek	3	Dyestone Mountain	Noblett Cr. 4	0	2.9
Zach's Branch	3	Dora	North Fork R. 6	0	4.7
Robinson Hollow	3	Dora	North Fork R. 6	0	5.9
Prarie Hollow	3	Nichols Knob	North Fork R. 6	0	4.1
Indian Creek	5	Nichols Knob	North Fork R. 6	17.5	22.1
Little Indian Cr.	4	Dyestone Mountain	Indian Cr. 5	5.3	8.5
NFW023	3	Cabool SE	Little Indian Cr. 4	0	5.2
Middle Indian Cr.	3	Dyestone Mountain	Indian Cr. 4	4.0	7.4
Clifty Creek	4	Nichols Knob	North Fork R. 5	2.9	16.4
Jim Coble Hollow	3	Nichols Knob	Clifty Cr. 4	0	4.5
Red Bank Creek	3	Vanzant	Clifty Cr. 4	0	4.8
East Clifty Creek	3	Mountin Grove S	Clifty Cr. 4	0	3.7
Greasy Creek	3	Cabool SW	North Fork R. 5	0	5.9
Hungry Creek	4	Cabool SW	North Fork R. 5	1.6	7.0
NFW024	3	Cabool SW	Hungry Cr. 4	0	3.4
Little Creek	3	Cabool SW	North Fork R. 4	1.3	11.3
Panther Creek	3	Cabool SW	North Fork R. 4	0	4.9
Bryant Creek	6	Udall	North Fork R. 7	58.3	71.2

P-Permanent Stream Miles (Based on USGS 7.5' topographical maps)

T-Total Stream Miles (Digitized from USGS 7.5' topographical maps for 4th order and larger streams. Determined from 1:100,000 scale GIS hydrography coverage for 3rd order streams.)

Table Ge01. Third order and larger streams of the North Fork Watershed.

Stream Name	Order	USGS 7.5' Quad at Stream Mouth	Name and Order Recieving Stream	Length	
				P	T
Little Pine Creek	3	Udall	Bryant Cr. 6	0	6.8
Caney Creek	5	Sycamore	Bryant Cr. 6	2.4	12.1
Pine Creek	4	Sycamore	Caney Cr. 5	2.9	14.3
Holdman Hollow	3	Sycamore	Pine Cr. 4	0	2.9
Wiedensaul Hollow	3	Sycamore	Caney Cr. 4	0	4.1
Lottie Hollow	3	Sycamore	Bryant Cr. 6	0	3.2
Bollinger Branch	3	Sycamore	Bryant Cr. 6	0	6.0
Hurricane Creek	3	Sycamore	Bryant Cr. 6	0	4.7
Trail Creek	4	Sycamore	Bryant Cr. 6	0	8.6
Burgess Hollow	3	Gentryville	Trail Cr. 4	0	6.4
Brown Hollow	3	Gentryville	Trail Cr. 4	0	4.1
Owens Hollow	3	Gentryville	Bryant Cr. 6	0	3.5
Dry Creek	3	Gentryville	Bryant Cr. 6	0	5.1
Brush Creek	4	Gentryville	Bryant Cr. 6	7.2	14.6
Little Brush Creek	3	Gentryville	Brush Cr. 4	3.0	6.3
Pedro Hollow	3	Vanzant	Brush Cr. 4	0	4.0

West Fork	3	Vanzant	Brush Cr. 4	0	4.2
Cane Bottom Hol.	3	Gentryville	Bryant Cr. 6	0	2.5
Spring Creek	4	Gentryville	Bryant Cr. 6	3.8	19.1
Brixey Creek	3	Rockbridge	Spring Cr. 4	1.9	5.8
Gardner Hollow	3	Rockbridge	Spring Cr. 4	0	4.4

P-Permanent Stream Miles (Based on USGS 7.5' topographical maps)

T-Total Stream Miles (Digitized from USGS 7.5' topographical maps for 4th order and larger streams. Determined from 1:100,000 scale GIS hydrography coverage for 3rd order streams.)

Table Ge01. Third order and larger streams of the North Fork Watershed.

Stream Name	Order	USGS 7.5' Quad at Stream Mouth	Name and Order Recieving Stream	Length	
				P	T
NFW001	3	Rockbridge	Spring Cr. 4	0	2.9
Smith Hollow	3	Rockbridge	Spring Cr. 4	0	6.7
Nance Creek	3	Rockbridge	Spring Cr. 4	0	2.6
Smith Hollow	3	Wasola	Spring Cr. 4	0	6.7
Fox Creek	5	Rockbridge	Bryant Cr. 6	9.7	28.0
Coontz Hollow	3	Brushy Knob	Fox Cr. 5	0	3.7
Clever Creek	4	Brushy Knob	Fox Cr. 5	0	9.0
Wolfpen Hollow	3	Brushy Knob	Clever Cr. 4	0	3.3
Greasy Creek	3	Brushy Knob	Fox Cr. 4	0	4.4
NFW002	3	Vanzant	Fox Cr. 4	0	3.4
NFW003	3	Mountain Grove S	Fox Cr. 4	0	4.2

East Prong	3	Mountain Grove S	Fox Cr. 4	1.2	4.9
NFW004	3	Mountain Grove S	Fox Cr. 4	0	4.4
Boiler Hollow	3	Rockbridge	Bryant Cr. 6	0	1.9
Rippee Creek	4	Rockbridge	Bryant Cr. 6	5.3	10.2
Strong Spring Br.	3	Wasola	Rippee Cr. 4	0	1.8
Hunter Creek	5	Brushy Knob	Bryant Cr. 6	7.0	12.6
Whites Creek	4	Sweden	Hunter Cr. 5	2.8	8.6
Jack's Fork	3	Sweden	Whites Cr. 4	0	4.6
NFW005	3	Sweden	Whites Cr. 4	0	3.3
Wildcat Creek	3	Sweden	Hunter cr. 4	0	3.9

P-Permanent Stream Miles (Based on USGS 7.5' topographical maps)

T-Total Stream Miles (Digitized from USGS 7.5' topographical maps for 4th order and larger streams. Determined from 1:100,000 scale GIS hydrography coverage for 3rd order streams.)

Table Ge01. Third order and larger streams of the North Fork Watershed.

Stream Name	Order	USGS 7.5' Quad at Stream Mouth	Name and Order Recieving Stream	Length	
				P	T
Bluegrass Hollow	4	Brushy knob	Bryant Cr. 5	0	5.3
Wilson Hollow	3	Brushy Knob	Bluegrass Hol. 4	0	2.5
Tarbutton Creek	3	Sweden	Bryant Cr. 5	3.0	4.9
Camp Creek	3	Sweden	Bryant Cr. 5	0	2.8
Bill Mack's Creek	3	Sweden	Bryant Cr. 5	0	4.6
Dry Creek	5	Sweden	Bryant Cr. 5	0	12.4

S. Fork Dry Creek	4	Mansfield	Dry Cr. 5	0	8.5
NFW006	3	Norwood	S. Fork Dry Cr. 4	0	4.2
Puncheon Camp Cr.	3	Mansfield	Dry Cr. 5	0	6.9
NFW007	3	Mansfield	Puncheon Cmp Cr. 4	0	2.7
NFW008	3	Norwood	Dry Cr. 4	0	3.5
NFW009	3	Norwood	Dry Cr. 4	0	2.9
Prairie Hollow	3	Mansfield	Bryant Cr. 4	0	8.5
Panther Hollow	3	Mansfield	Bryant Cr. 4	0	2.1

P-Permanent Stream Miles (Based on USGS 7.5' topographical maps)

T-Total Stream Miles (Digitized from USGS 7.5' topographical maps for 4th order and larger streams. Determined from 1:100,000 scale GIS hydrography coverage for 3rd order streams.)

Table Ge02. Stream length by order (Strahler) and total length for fifth order (Horton) and larger streams in the North Fork Watershed (Missouri). Note figures are rounded to the nearest tenth, therefore total length may not match sum of miles per order.

Stream Name	Length for Order (miles)							Total Length
	7	6	5	4	3	2	1	
North Fork R.	24.3	15.2	16.3	5.6	2.8	1.6	1.1	66.6
Spring Cr. (South)			23.8	1.8	3.0	0.3	0.5	29.4
Spring Cr. (North)		2.7	6.9	10.0	1.5	1.3	0.9	23.3
Dry Cr. (Spring Cr.)			10.4	2.8	3.7	2.8	0.6	20.4
Indian Cr.			13.3	0.3	4.9	2.5	1.0	22.1
Bryant Cr.		45.8	9.4	2.7	9.9	2.5	0.9	71.2
Caney Cr.			1.6	1.0	2.7	4.4	2.5	12.1
Hunter Cr.			3.6	2.9	4.7	0.8	0.6	12.6
Dry Cr. (Bryant)			3.3	6.1	1.0	1.1	0.9	12.4
Bennetts R.			1.3	5.0	1.1	0.5	0.7	8.5
Lick Cr.			5.0	6.4	3.5	Landers Hol./ Finley Hol.		14.9
Fox Cr.			12.8	10.1	3.6	0.6	0.9	28.0
Total	24.3	63.7	107.7	54.7	42.4	18.4	10.6	321.5

Table Ge03. North Fork Watershed stream reaches designated as losing in Table J Rules of Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality. Code of State Regulations (MDNR 1996a).

Stream	Miles	From	To
Bryant Cr.	8.0	se,sw,ne,23,27n,15w	sw,sw,sw,21,26n,14w
Browning Hl.	2.5	sw,ne,nw,27,25n,14w	ne,ne,se,01,24n,14w
Clifty Cr.	5.5	nw,ne,se,28,27n,12w	se,ne,se,14,26n,12w
Brush Cr.	4.0	ne,nw,se,21,26n,12w	nw,nw,se,36,26n,13w
Smith Hl.	4.0	se,nw,ne,31,25n,14w	se,ne,se,02,24n,14w
Spring Cr.	12.0	ne,sw,sw,22,25n,15w	se,sw,nw,05,24n,13w
Horton Hl.	2.0	nw,sw,ne,05,25n,10w	sw,ne,sw,18,25n,10w
Moss Hl.	4.0	ne,se,nw,34,26n,10w	sw,se,se,18,25n,10w
Crooked Br.	5.0	nw,sw,se,21,24n,10w	se,nw,se,22,24n,11w
Spring Cr.	10.5	nw,nw,nw,06,23n,09w	sw,sw,sw,15,23n,11w
Tabor Cr.	5.0	nw,se,sw,19,24n,09w	se,sw,sw,34,24n,10w
Tabor Cr.	10.0	se,ne,nw,34,25n,09w	se,ne,sw,35,25n,11w
Trib. To Tabor Cr.	2.0	nw,se,ne,35,25n,10w	ne,nw,sw,11,24n,10w
Davis Cr.	2.0	ne,ne,sw,19,23n,09w	ne,nw,sw,14,23n,10w
Kenyon Hl.	2.5	sw,se,nw,02,25n,10w	ne,ne,ne,21,25n,10w
Spring Cr.	5.0	nw,23,24n,09w	nw,nw,nw,06,23n,09w
Trib. To Spring Cr.	4.0	sw,se,nw,02,23n,09w	sw,nw,sw,32,24n,09w
Bennett's R.	6.0	ne,sw,01,22n,10w	ne,nw,ne,02,21n,10w
Ray Br.	2.5	ne,sw,sw,32,22n,09w	se,sw,ne,02,21n,10w
N. Fk. Dry Cr.	3.5	ne,ne,ne,30,26n,09w	nw,nw,nw,18,25n,09w

Dry Cr.	6.0	nw,ne,se,20,26n,09w	nw,nw,nw,18,25n,09w
Dry Cr.	8.0	nw,nw,nw,18,25n,09w	sw,se,sw,23,25n,11w
Trib. To Dry Cr.	7.0	nw,ne,sw,14,25n,09w	sw,ne,nw,23,25n,10w

Table Ge03. North Fork Watershed stream reaches designated as losing in Table J (Continued) Rules of Department of Natural Resources Division 20-Clean Water Commission Chapter 7-Water Quality. Code of State Regulations (MDNR 1996a).

Stream	Miles	From	To
Unnamed Trib.	2.5	se,nw,se,32,24n,14w	nw,nw,ne,35,24n,15w
South Fork	5.5	ne,sw,nw,28,24n,14w	sw,nw,se,33,24n,15w
Smith Hl.	2.0	ne,nw,sw,18,24n,14w	ne,ne,ne,17,24n,14w
Gardner Hl.	4.0	nw,sw,sw,24,24n,14w	ne,ne,se,01,24n,14w
Unnamed Trib.	3.0	se,sw,se,18,28n,13w	nw,nw,ne,05,28n,13w
Fox Cr.	4.0	nw,ne,ne,30,28n,13w	sw,ne,ne,09,27n,13w
Fox. Cr.	20.0	ne,ne,sw,20,28n,13w	se,ne,ne,29,25n,13w
Dry Cr.	7.5	sw,ne,nw,24,28n,14w	se,sw,sw,17,27n,14w
Prarie Hl.	3.0	se,sw,sw,28,28n,15w	sw,sw,se,03,27n,15w
Prarie Hl.	2.0	sw,nw,sw,28,28n,15w	ne,se,sw,03,27n,15w
Fry Cr./wolf Cr.	3.0	nw,sw,sw,11,28n,15w	sw,nw,se,25,29n,15w
Total	177.5		

Note: This table is not a final authority.

Table Ge04. Location and average discharge of selected springs in the North Fork Watershed (Vineyard and Feder 1974).

Spring Name	County	USGS 7.5' Quadrangle	Flow Rate (cfs)	Date
Althea	Ozark	Cureall NW	18.80	1926-1964
Big	Douglas	Dora	13.20	8-28-64
Blue	Ozark	Dora	16.10	11-67
Bryant	Douglas	Mansfield	0.57	8-19-36
Crystal	Douglas	Sweden	11.60	12-8-64
Hoffmeister	Douglas	Sweden	2.00	10-19-64
Rainbow	Ozark	Cureall NW	127.00	1919-66
Hodgson Mill	Ozark	Sycamore	36.4	1926-1966
Morris	Ozark	Rockbridge	3.24	11-15-65
North Fork	Ozark	Cureall NW	68.40	10-6-66
Rockbridge	Ozark	Rockbridge	21.90	12-8-64
Siloam	Howell	Siloam Springs	0.01	1892
Taylor	Ozark	Bakersfield	0.09	9-6-25
Topaz	Douglas	Nichols Knob	3.66	10-21-64
Wilder	Ozark	Cureall NW	8.51	11-6-64

Zanoni	Ozark	Sycamore	0.77	12-4-64

Table Ge05. Average gradient at order (Strahler) and overall average gradient for fifth order (Horton) and larger streams in the North Fork Watershed (Missouri).

Stream Name	Gradient At Order (ft/mi)							Average Gradient ft/mi
	7	6	5	4	3	2	1	
North Fork R.	6.6	6.7	9.2	18.2	32.9	67.5	151.0	12.8
Spring Cr. (South)			15.2	19.2	25.5	80.6	76.0	18.3
Spring Cr. (North)		10.7	11.8	22.9	39.9	68.7	97.5	25.0
Dry Cr. (Spring Cr.)			19.3	24.1	30.6	35.7	82.5	26.3
Indian Cr.			12.9	30.0	28.1	55.5	106.4	25.9
Bryant Cr.		5.9	11.0	16.1	25.9	74.7	161.4	14.1
Caney Cr.			15.3	26.0	34.7	56.9	128.9	58.6
Hunter Cr.			13.7	21.8	39.4	75.9	174.6	36.6
Dry Cr. (Bryant)			17.5	33.7	51.0	66.0	108.5	39.2
Bennett's R.			15.1	30.5	43.0	64.0	71.8	35.2
Lick Cr.			10.0	19.4	30.0	Landers Hol./ Finley Hol.		18.8
Fox Cr.			12.7	16.8	39.1	96.6	129.1	23.2